

Traffic Quality on the Atlanta Regional Network

VOLUME ONE: FREEWAYS (2007)

DRAFT REPORT

Prepared for
the Georgia Department of Transportation
by Skycomp, Inc. (Columbia, Maryland)



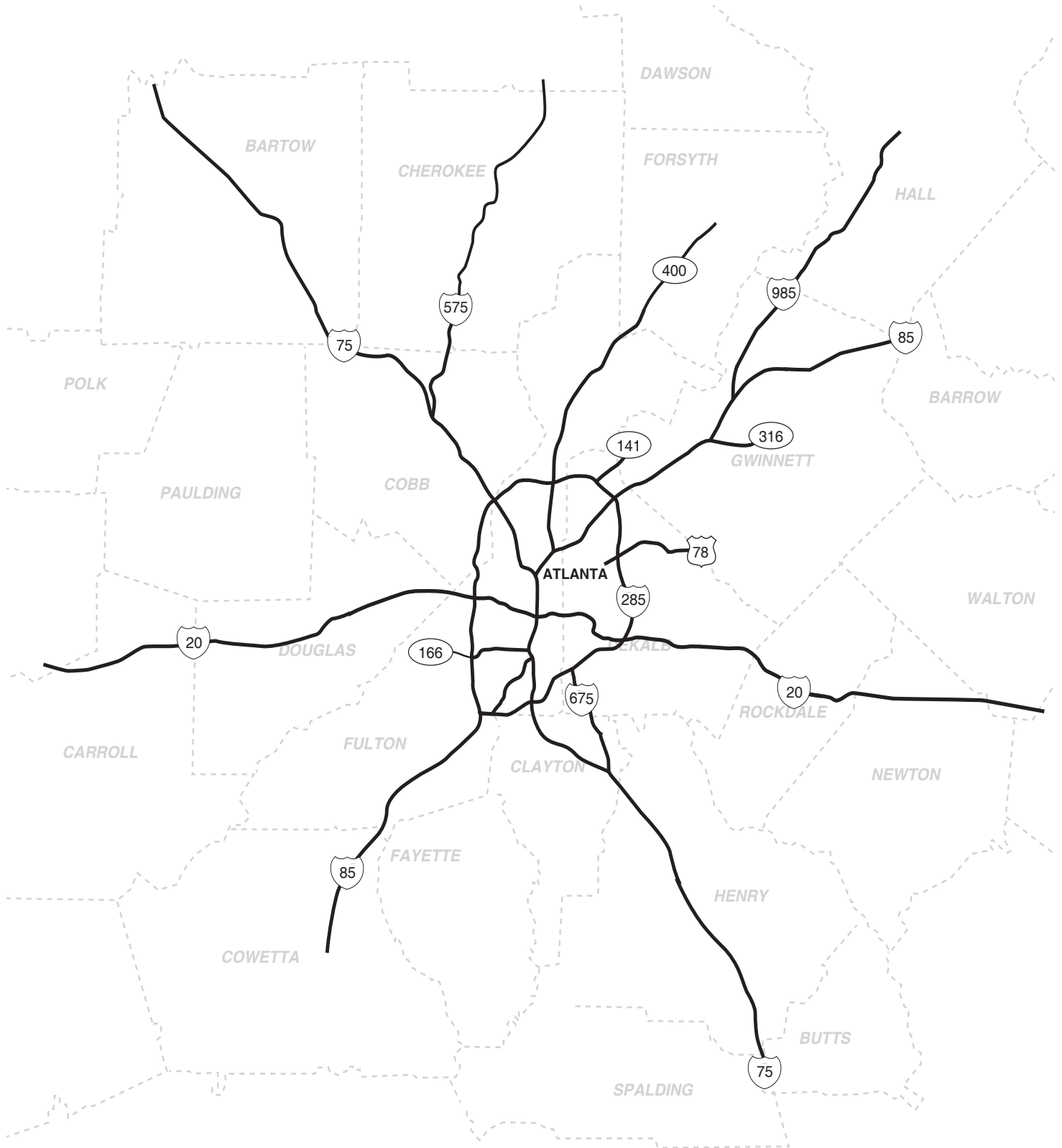
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Freeway Network

Fall 2007



INTRODUCTION

The purpose of this aerial survey program is to rate the performance of the regional Atlanta highway system on a recurring basis, and to provide related data to regional planners, stakeholders, and decision-makers. This mobility monitoring program began in the fall of 1998, at which time approximately 500 centerline miles of limited-access and arterial highway in the Atlanta metropolitan area were surveyed (data collection occurred during both morning and evening peak commuter periods). Coverage was repeated three years later, in the fall of 2001, leading to an identification of locations experiencing both improved and degraded mobility.

The early success of this survey program resulted in decisions to expand coverage, ultimately to include a high percentage of the state highways in the 22-county Atlanta planning region. Accordingly, approximately 250 centerline miles of highway in the outlying counties were added in the spring of 2002, and an additional 1,500 miles of arterial highways were added in the spring of 2004. Aerial surveys of the first 750 miles of highway were repeated in 2005 and 2007. Coverage of the 1500 miles of arterial highways added in 2004 was repeated in the spring of 2008.

The aerial survey methodology takes advantage of the mobility and vantage point of fixed-wing aircraft, permitting data collection across a vast highway network that could not be affordably accomplished using traditional ground-based survey methods. During each survey period, up to eight aircraft at a time followed designated routes along the primary highways; each highway segment is photographed in its entirety approximately 24 times. Performance ratings derived from the photography are presented in this report in graphical format.

For the purpose of presentation in a logical format, the findings of the 2007 and 2008 survey iterations have been grouped into two volumes: *Volume One* presents all findings related to the freeway system; these were entirely derived from the fall 2007 survey flights. *Volume Two* presents all 2007 / 2008 findings related to signalized (interrupted-flow) arterial state highways.

FEATURES OF THE AERIAL SURVEY PROGRAM

During this aerial survey program, overlapping photographic coverage was obtained for each designated highway, repeated once an hour over four mornings and four evening commuter periods. The morning coverage time was 6:30-9:30 a.m., and the evening time was 4:00-7:00 p.m. Survey flights were conducted on weekdays, excluding Monday mornings, Friday evenings and mornings after holidays. Data were extracted from the aerial photographs to measure average recurring daily traffic conditions by link and by time period. Features of the aerial survey program include:

1) Report of findings: Highway Performance Rating Tables, Volumes One and Two, 2007 / 2008

Volume One presents performance-rating tables of 2007 traffic conditions on the region's freeway sub-system. The ratings are presented by highway, highway segment, direction, and time period. For these uninterrupted-flow facilities, the ratings are density-based level-of-service (LOS) designations "A", "B", "C", "D", "E" and "F", as defined in the 2000 Highway Capacity Manual. Details on how these level-of-service ratings were generated are provided in *Appendix A* of *Volume One*.

Volume Two presents performance-rating tables of traffic conditions on the backbone of the region's signalized arterial sub-system; some of these highways were surveyed in the fall of 2007 and the remainder were surveyed in the spring of 2008. For these interrupted-flow facilities, a surrogate level-of-service measure has been used, based on the size of vehicle platoons and the degree of queuing at signalized intersections. Details on how these surrogate level-of-service ratings were generated are also provided in *Appendix A* of *Volume Two*.

The performance rating tables in *Volume One* and *Volume Two* also contain arrowheads that depict locations of recurring congestion; narratives that clarify the severity and frequency of the congestion accompany each arrowhead. Where evident, apparent causes of the problems are also described.

2) Special Summary Report: Mobility Assessment and Bottleneck Changes, 2008 vs. 2005

The *Mobility Assessment and Bottleneck Changes Report* originally produced comparing 2005 with 2001 has been updated to compare 2007/08 with 2004/05. This special report summarizes the state of mobility on the network as of fall 2007 / spring 2008; and it highlights the specific bottleneck improvements and degradations that have been documented over the course of the survey program. This report presents extended “bottleneck” and “comparative” arrowhead maps that depict the location and typical extent of congested bottlenecks. “Before” and “after” highlight aerial photographs are also provided in many cases to illustrate major changes on the system.

3) Web-Based Module for the GDOT web site

The web-based product presents data collected from all 2,250 miles of surveyed highway; this product allows data queries from each of the surveyed years, and includes thousands of highlight aerial photographs of congestion found in the 21-county planning region. This product also contains detailed “bottleneck” and “comparative” arrowhead maps that highlight exactly where congestion was found on the system during each survey iteration. The product can be viewed over the internet for private or group use; the interactive feature allows a presenter to respond to audience interests by going to specific locations as appropriate. This product also supports digital downloads of all reports created over the course of this survey program. Lastly, a data extraction module allows users to create graphic displays and download performance rating tables based on user-selected filters.

4) Survey Database

A primary deliverable for this project is the *Survey Database*, built for the *Microsoft Access*™ platform. This database contains all of the data collected from the aerial survey program, including vehicle counts and road segmentation, flight times and dates, and the highway segment measurements used to calculate freeway densities. Using this database, a number of reports can be displayed or printed, including day-by-day comparative reports, segment densities, and incident information.

5) Speed/Density Relationship on freeways

In order to allow the estimation of vehicle speeds from densities on the freeways, Skycomp has built a database from data collected in the Washington D.C. metropolitan area and other cities. This database demonstrates the relationship between traffic densities and speeds. From this database, a look-up table was developed relating the two variables. The result of Skycomp’s work is provided in *Appendix B*.

DISCLAIMER

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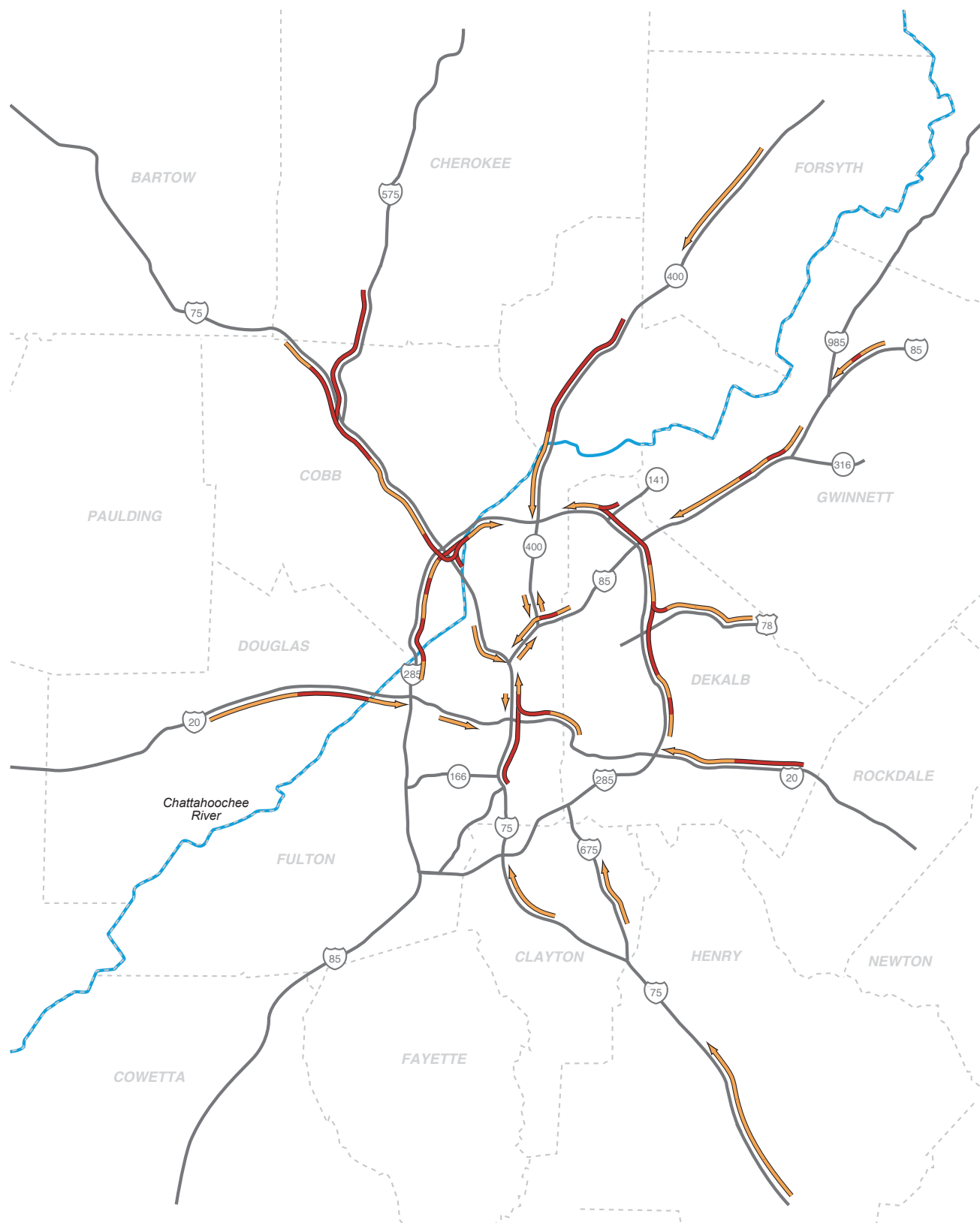
QUESTIONS

If there are any questions about this survey program or the underlying methodology, please direct them to Greg Jordan at 410-884-6900.

Part One - Regional Congestion Graphics

Morning & Evening Regional Congestion Graphics

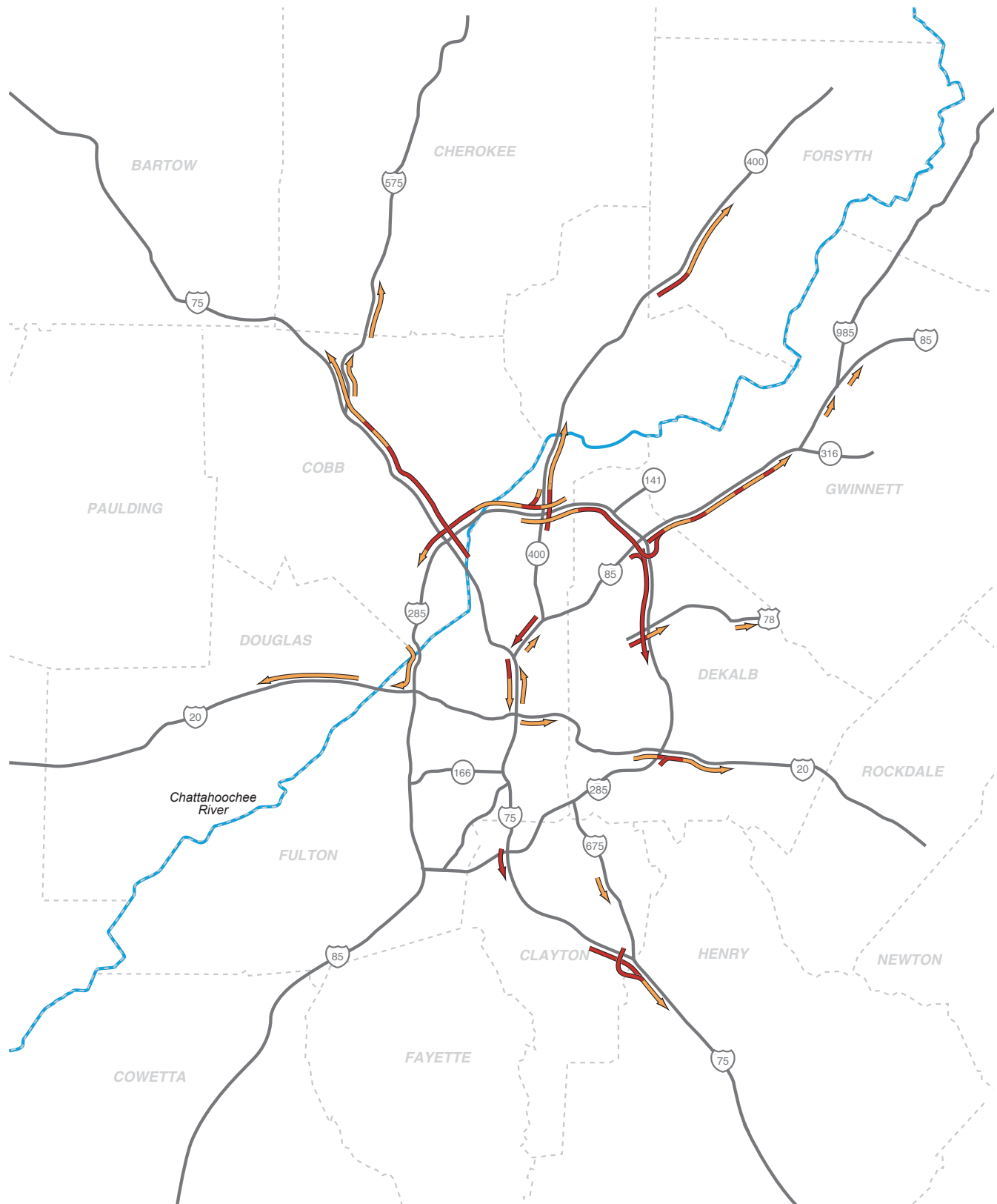
Morning Recurring Freeway Congestion (6:30 - 9:30 a.m.) 2007



Legend

- Severe mainline congestion (<30 mph)
- Moderate or intermittent mainline congestion (30-50 mph)

Evening Recurring Freeway Congestion (4:00 - 7:00 p.m.) 2007



Legend

- ← Severe mainline congestion (<30 mph)
- ← Moderate or intermittent mainline congestion (30-50 mph)

(Blank)

Part Two - Performance Ratings (FREEWAYS)

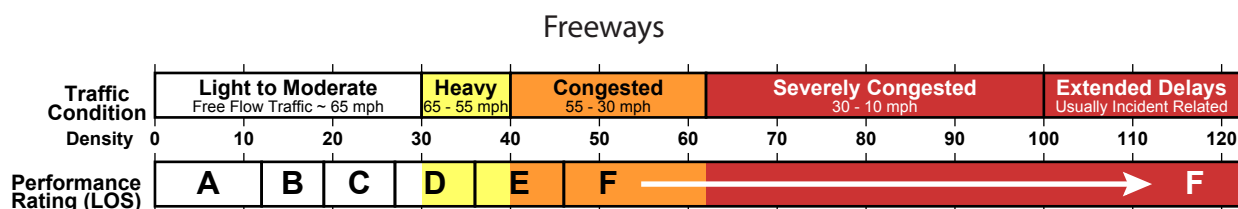
Performance Rating Tables, Fall 2007

This section of the report presents performance rating tables of 2007 traffic conditions on the region's freeway sub-system. The ratings are presented by highway, highway segment, direction and time period. For clarification, these performance rating tables also contain arrowheads that depict the typical extent and location of recurring congestion. Details on how these level-of-service ratings were generated are provided in *Appendix A*.

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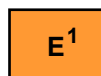
Performance Rating Descriptions: FREEWAYS

For limited access facilities, the ratings are density-based level-of-service designations “A” through “F”, as defined in the 2000 Highway Capacity Manual. A summary of density based level-of-service is provided below (a more detailed discussion of level-of-service is provided in Appendix A).



Note: In some segments congestion was not uniform, so that high densities associated with congestion were “diluted” by low densities found elsewhere in the segment or at other times. In these cases, averaged density values do not reflect the variety of conditions found in the segments. This occurrence is known as “nested congestion”. Accordingly, four types of “nested congestion” have been identified with superscripts, as follows:

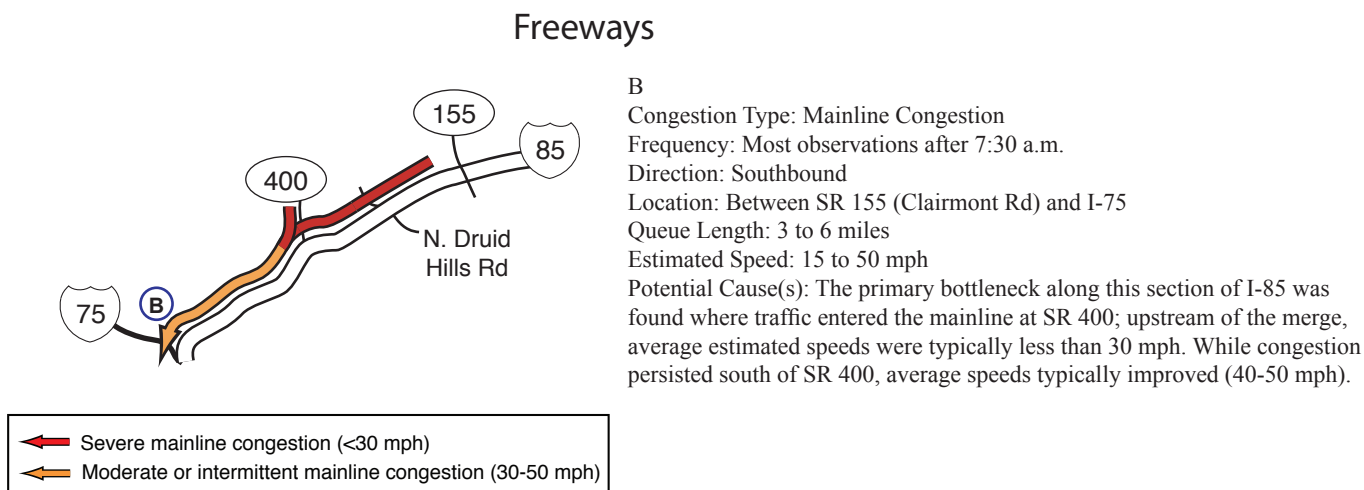
Nested congestion superscripts:



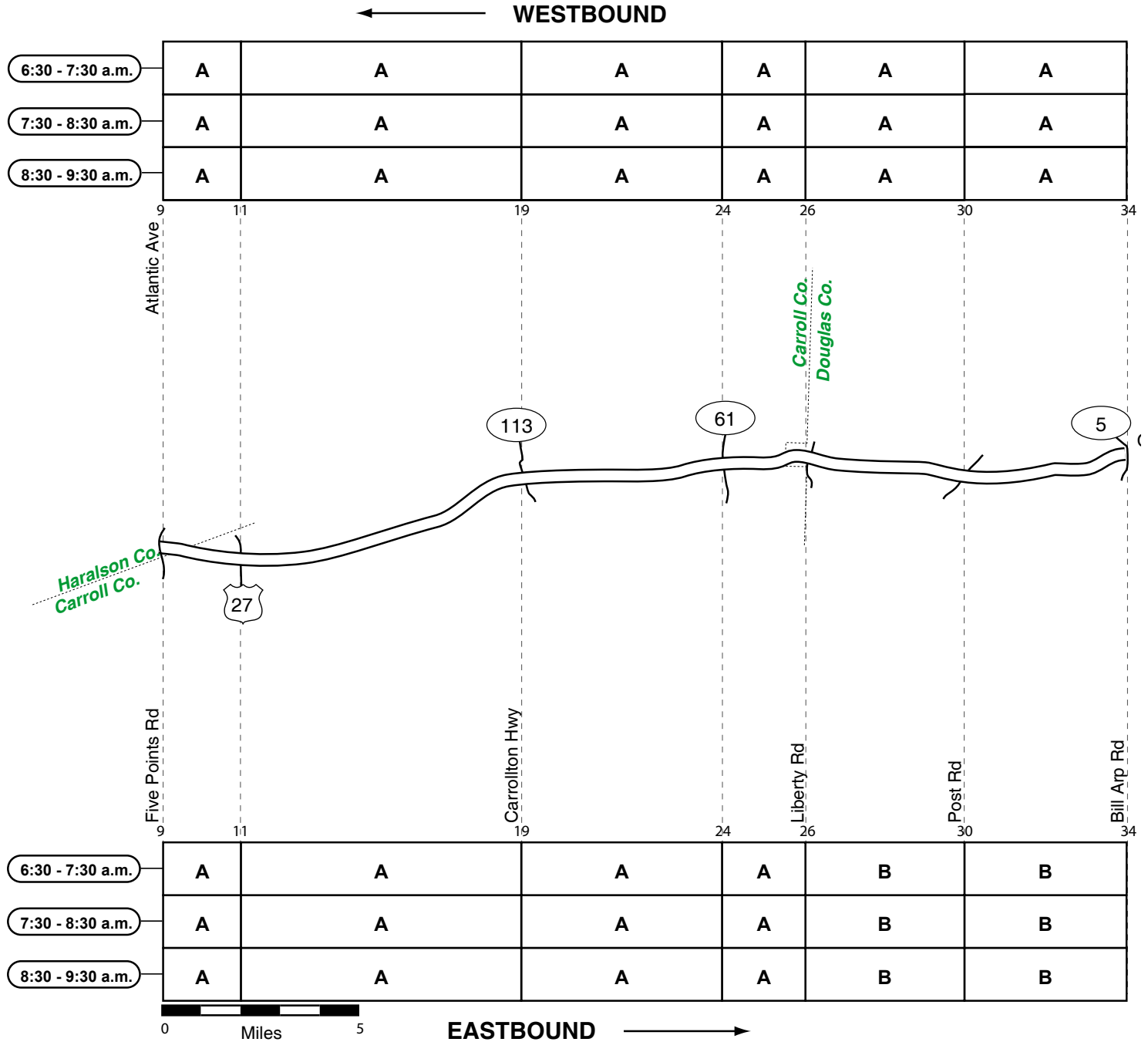
- 1 Type 1 nested congestion (some days, not others).
- 2 Type 2 nested congestion (more severe in left or right-hand lanes).
- 3 Type 3 nested congestion (present only in the first or second half-hour period).
- 4 Type 4 nested congestion (partial length of segment).

Bottleneck Graphics and Analytical Notes

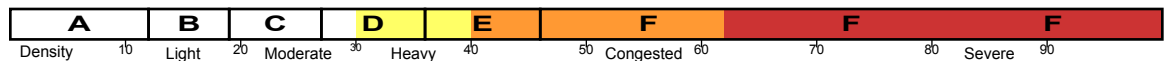
Each performance rating table includes arrowheads that depict locations where congestion was found; notes that clarify the frequency and severity of the congestion accompany each arrowhead. Examples from the report are provided below.



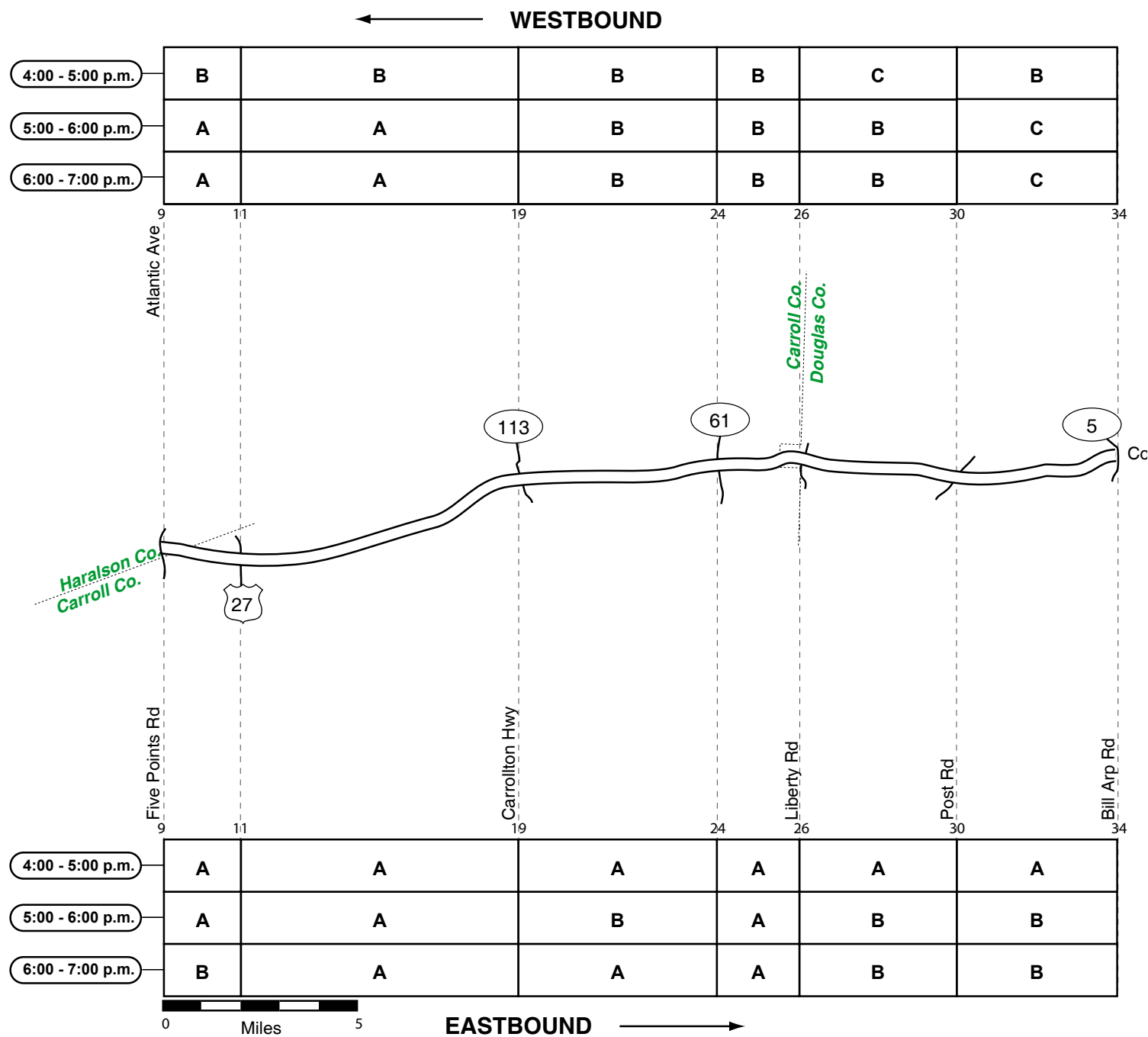
I-20 (Carroll & Douglas Counties) - Morning



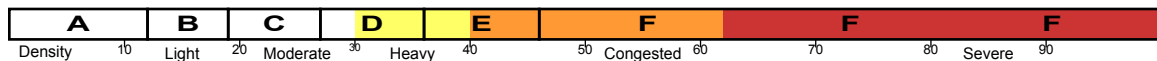
Traffic Quality Rating

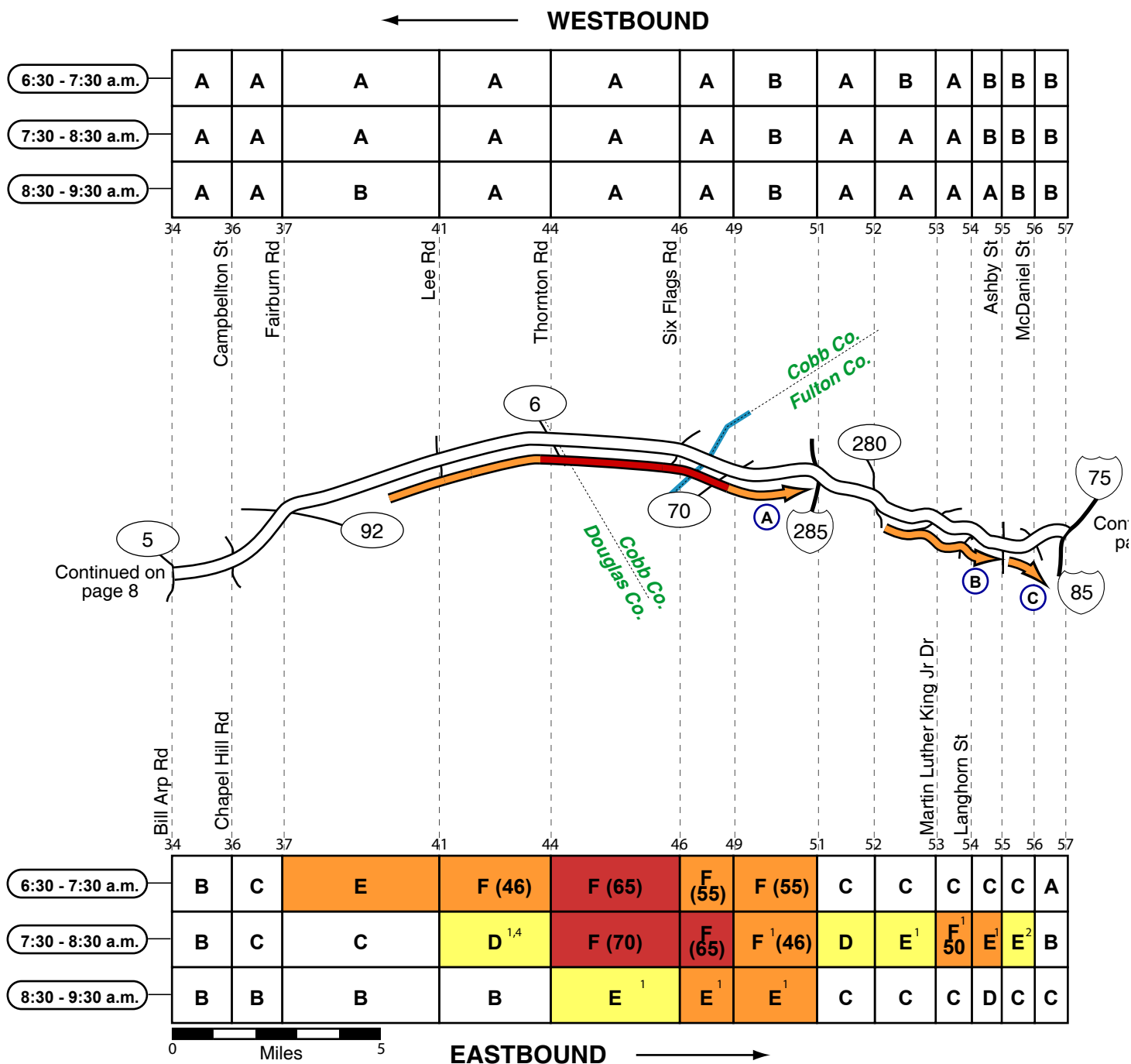
Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

I-20 (Carroll & Douglas Counties) - Evening

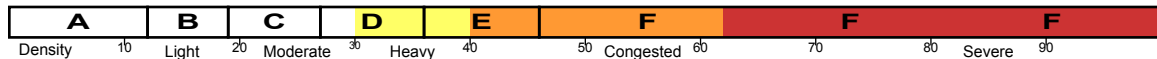


Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

I-20 (Douglas/Cobb & Fulton Counties) - Morning

Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

I-20 (Douglas/Cobb & Fulton Counties) - Morning

A

Congestion Type: Mainline Congestion

Frequency: Most observations

Direction: Eastbound

Location: Between SR 92 and I-285

Queue Length: 10 to 12 miles

Estimated Speed: 30 to 50 mph

Potential Cause(s): Factors that may have exacerbated the congestion included: 1) traffic entering the mainline at the interchanges along this section of I-20; 2) two separate lane drops (4 lanes to 3) - one at Fulton Industrial Blvd - one between SR 6 and Riverside Pkwy; 3) sun glare.

B

Congestion Type: Mainline Congestion

Frequency: Most observations 7:30 to 8:30 a.m.

Direction: Eastbound

Location: Between SR 280 (Hightower Rd) and Ashby St

Queue Length: 2 to 3 miles

Estimated Speed: 40 to 50 mph

Potential Cause(s): Eastbound congestion appeared to be caused or exacerbated by sun glare and the roadway geometrics (curves).

C

Congestion Type: Exit Ramp Queue

Location: McDaniel St

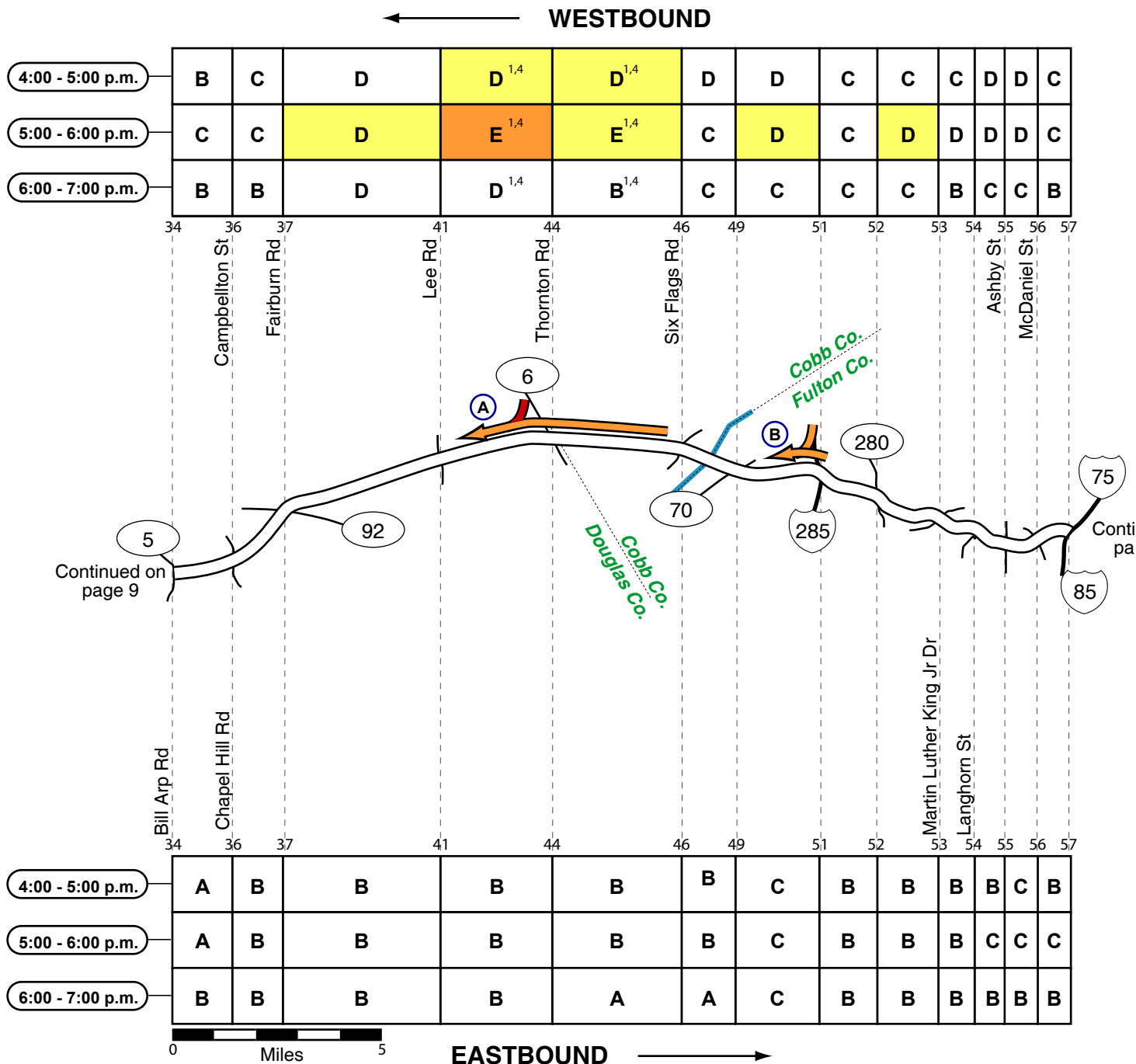
Frequency: Intermittent

Direction: Eastbound

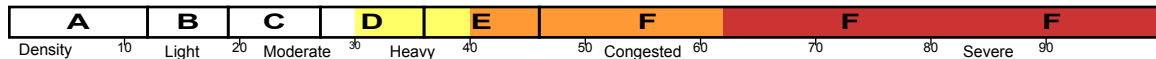
Queue Population: 20 to 30 vpl

Number of Lanes: Two

Note: In some cases, congestion on the exit ramp extended back into the right lane on I-20.

I-20 (Douglas/Cobb & Fulton Counties) - Evening

Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

I-20 (Douglas/Cobb & Fulton Counties) - Evening

A

Congestion Type: Mainline Congestion

Frequency: On some days but not others

Direction: Westbound

Location: Between Six Flags Dr and Lee Rd

Queue Length: 5 to 6 miles

Estimated Speed: 40 to 50 mph

Potential Cause(s): Factors contributing to the congestion were: 1) the lane drop (4 lanes to 3) at SR 6 and; 2) the merging associated with the interchanges along this corridor.

B

Congestion Type: Mainline Congestion

Frequency: Most observations

Direction: Westbound

Location: Between I-285 and SR 70

Queue Length: 0.5 to 1 miles

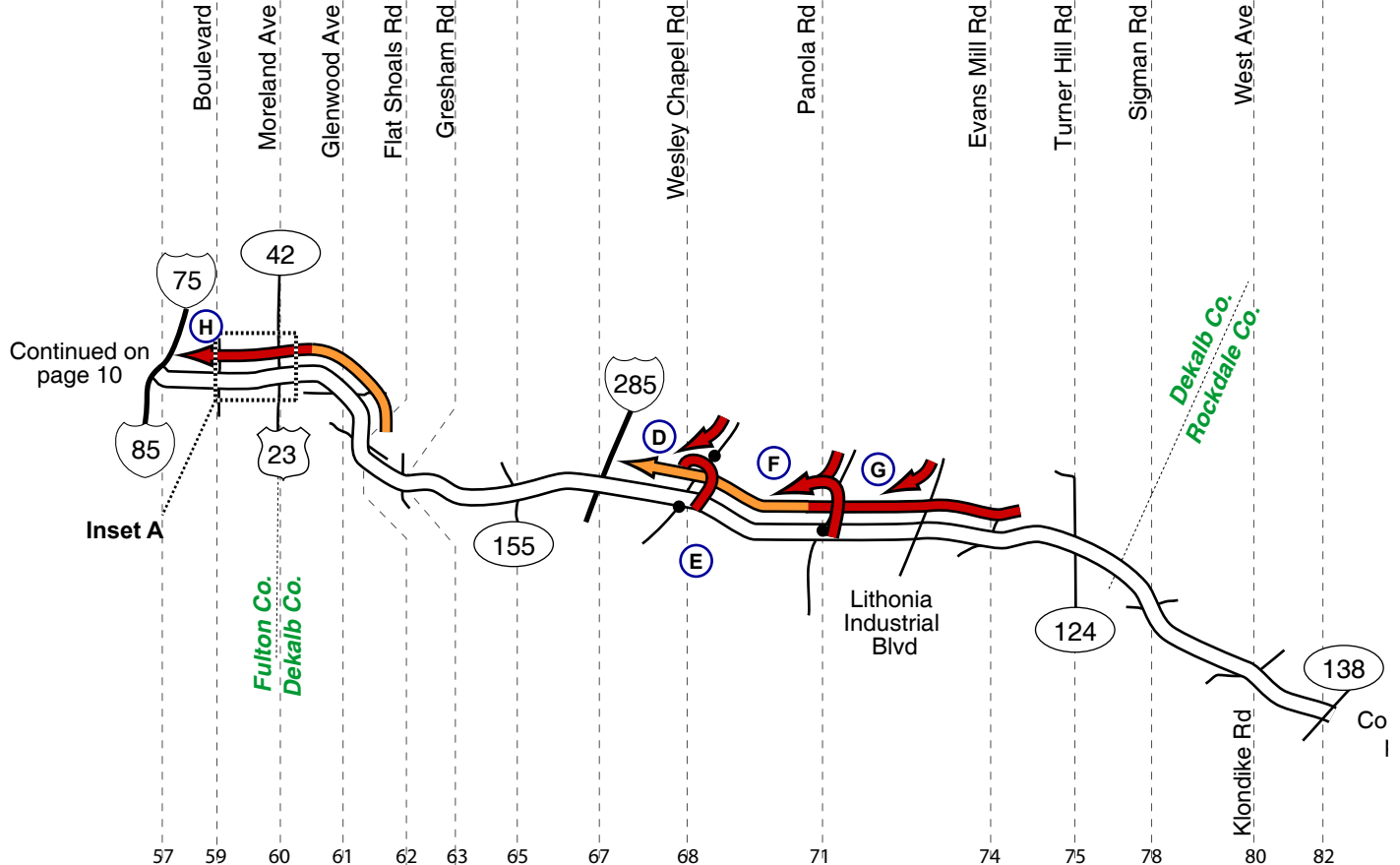
Estimated Speed: 40 to 50 mph

Potential Cause(s): Traffic entering from the Perimeter

I-20 (Fulton/Dekalb & Rockdale Counties) - Morning

← WESTBOUND

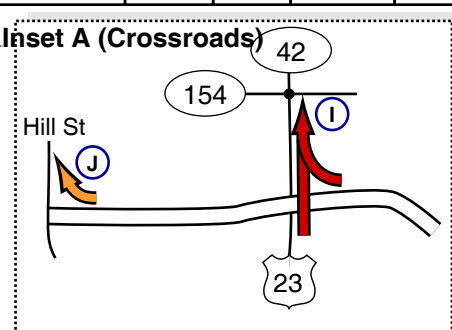
| | | | | | | | | | | | | | | | |
|------------------|----------------|----------------|----------------|----------------|----|----|----|---------------------|--------|--------|----------------|----|----|----|----|
| 6:30 - 7:30 a.m. | E ³ | E ³ | E ¹ | D ¹ | C | C | C | E | F (50) | F (95) | E ⁴ | D | C | D | |
| 7:30 - 8:30 a.m. | F (60) | F (75) | F (60) | E ¹ | D | C | C | F ⁴ (46) | F (60) | F (80) | C | C | B | C | |
| 8:30 - 9:30 a.m. | F (70) | F (60) | D ¹ | C | C | B | C | D ¹ | D | C | B | C | B | B | |
| | 57 | 59 | 60 | 61 | 62 | 63 | 65 | 67 | 68 | 71 | 74 | 75 | 78 | 80 | 82 |



| | | | | | | | | | | | | | | |
|------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6:30 - 7:30 a.m. | B | B | A | A | A | A | A | B | B | B | B | B | A | B |
| 7:30 - 8:30 a.m. | B | B | A | A | A | A | A | B | C | B | B | B | B | B |
| 8:30 - 9:30 a.m. | B | B | A | A | A | A | A | B | C | B | B | B | B | B |

0 Miles 5

→ EASTBOUND



Traffic Quality Rating

| | | | | | | | | | | | | | | |
|---------|----|-------|----|----------|----|-------|----|----|-----------|----|----|----|--------|----|
| A | B | C | D | E | F | | F | | | F | | | | |
| Density | 10 | Light | 20 | Moderate | 30 | Heavy | 40 | 50 | Congested | 60 | 70 | 80 | Severe | 90 |

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

I-20 (Fulton/Dekalb & Rockdale Counties) - Morning

D

Congestion Type: Mainline Congestion

Frequency: Most observations before 9:00 a.m.

Direction: Westbound

Location: Between SR 124 (Turner Hill Rd) and I-285

Queue Length: 5 to 8 miles

Estimated Speed: 15 to 50 mph

Potential Cause(s): Traffic entering the mainline at the interchanges along this section of I-20 appeared to exacerbate the congestion.

Congestion between SR 124 and Panola Rd was particularly severe during the peak period with average speeds estimated at 15 to 30 mph; while congestion typically persisted west of Panola Rd, speeds typically improved (40-50 mph).

E

Congestion Type: Entrance Ramp Queue

Location: Wesley Chapel Rd

Frequency: Most observations

Direction: NB & SB

Queue Population: 20 to 70 vpl

Number of Lanes: Two

Note: Congestion on Wesley Chapel Rd was typically found in both directions approaching the I-20 Interchange (left two lanes northbound; right two lanes southbound); the head of the queues were found either at the signals on Wesley Chapel Rd or at the head of the entrance ramp where vehicles merged into congested westbound flow on I-20. The lane drop (2 lanes to 1) on the entrance ramp may have exacerbated the congestion.

F

Congestion Type: Entrance Ramp Queue

Location: Panola Rd

Frequency: Most observations

Direction: NB & SB

Queue Population: 20 to 60 vpl

Number of Lanes: One

Note: Congestion on Panola Rd was typically found in both directions approaching the I-20 Interchange (left lane northbound; right lane southbound); the head of the queues were found either at the signals on Panola Rd or at the head of the entrance ramp where vehicles merged into congested westbound flow on I-20.

G

Congestion Type: Entrance Ramp Queue

Location: Lithonia Industrial Blvd

Frequency: Most observations

Direction: Westbound

Queue Population: 30 to 100 vpl

Number of Lanes: One

Note: When congested, the head of the queue was found where vehicles merged into westbound flow on I-20; the lane drop (2 lanes to 1) on the entrance ramp appeared to exacerbate congestion.

H

Congestion Type: Mainline Congestion

Frequency: Most observations

Direction: Westbound

Location: Between Flat Shoals Rd and I-75/85

Queue Length: 3 to 5 miles

Estimated Speed: 25 to 50 mph

Potential Cause(s): Factors contributing to the congestion included:

1) the lane drop at the terminus of the HOV facility (5 lanes to 4); 2) congestion on the two-lane ramp to I-75 northbound (this congestion backed into the two right lanes, and ultimately across all lanes on I-20).

I

Congestion Type: Exit Ramp Queue

Location: SR 42 / US 23

Frequency: Most observations

Direction: WB / NB

Queue Population: 20 to 50 vpl

Number of Lanes: One / Two

Note: Northbound congestion on SR 42 was typically found approaching the signal at SR 154 located just north of I-20; intermittent congestion was also found in the right lane on the I-20 exit ramp; vehicles at the head of the ramp typically had to merge into northbound congestion on SR 42.

J

Congestion Type: Exit Ramp Queue

Location: Hill St

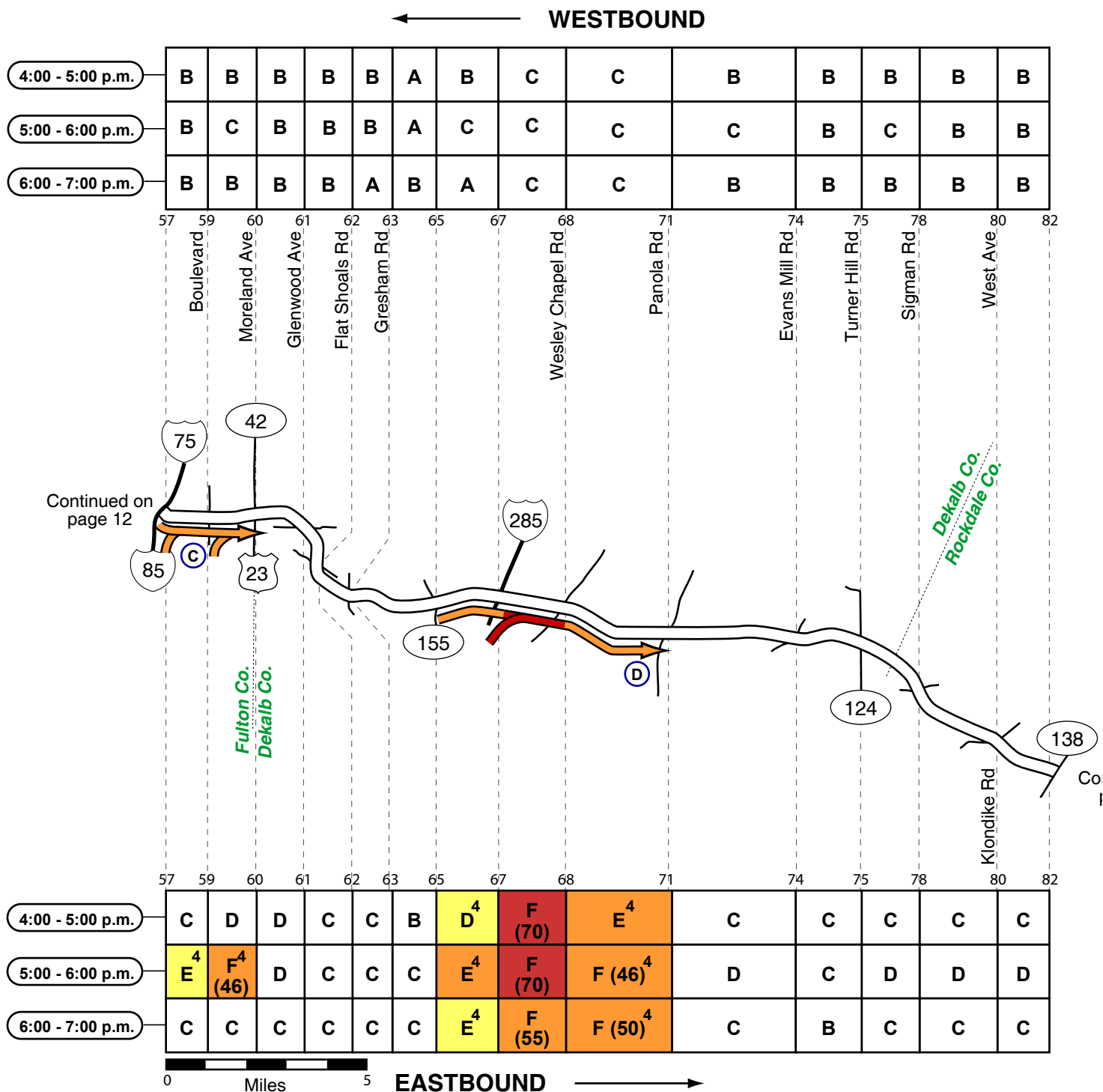
Frequency: Intermittent

Direction: Westbound

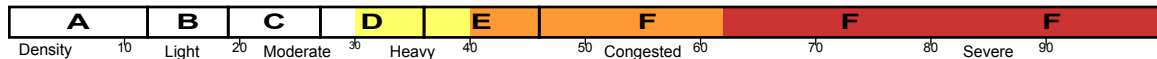
Queue Population: 20 to 40 vpl

Number of Lanes: One

Note: When congested, vehicles were queued in the right lane on the exit ramp; vehicles at the head of the ramp waited to merge into the northbound lanes on Hill St.

I-20 (Fulton/Dekalb & Rockdale Counties) - Evening

Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

I-20 (Fulton/Dekalb & Rockdale Counties) - Evening

C

Congestion Type: Mainline Congestion

Frequency: On some days but not others

Direction: Eastbound

Location: Between I-75 and SR 42

Queue Length: 1.5 to 2.5 miles

Estimated Speed: 40 to 50 mph

Potential Cause(s): Merging associated with the interchanges along this section of I-20.

D

Congestion Type: Mainline Congestion

Frequency: Most observations

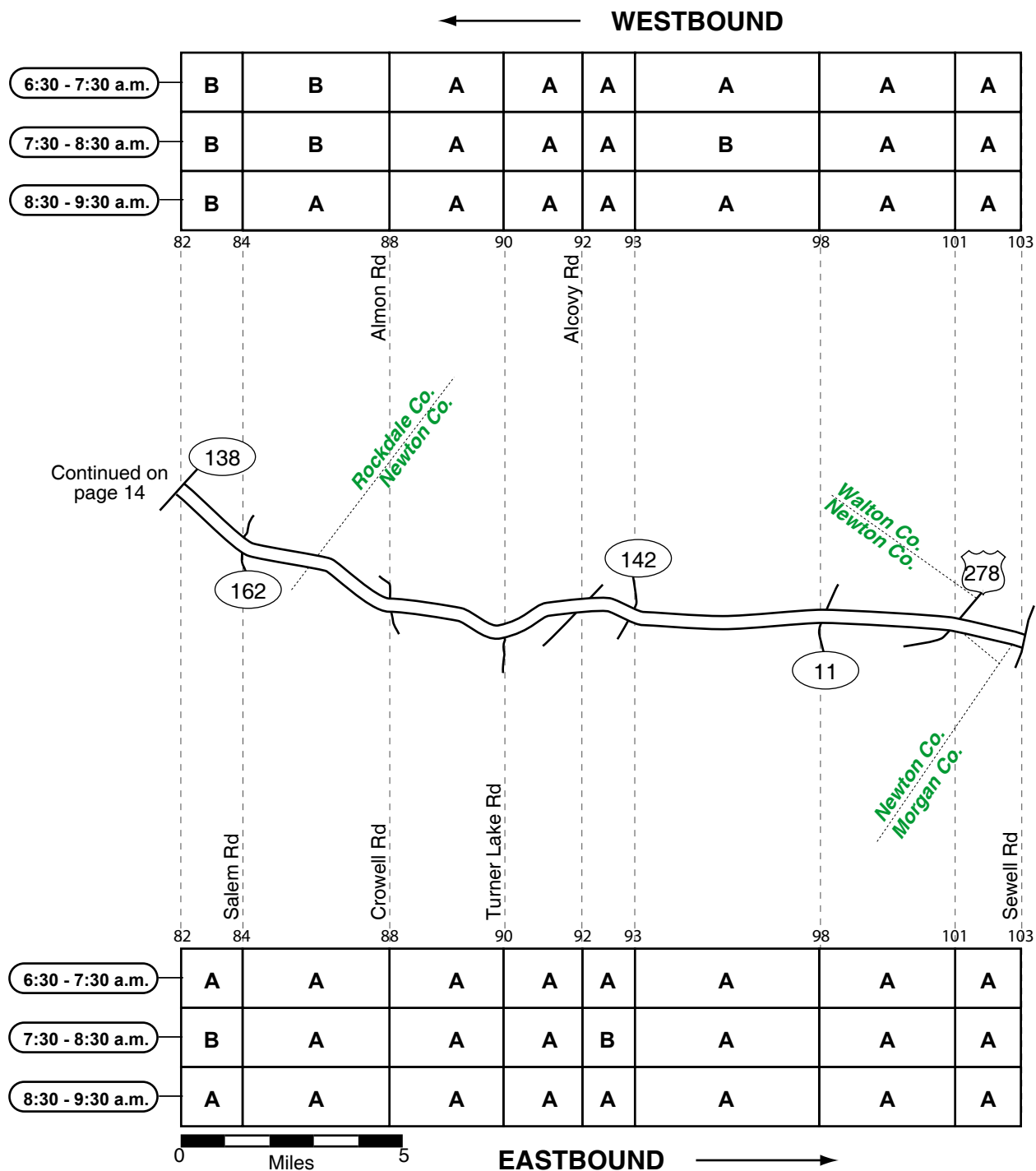
Direction: Eastbound

Location: Between SR 155 and Panola Rd

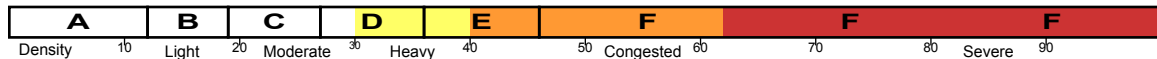
Queue Length: 4 to 6 miles

Estimated Speed: 25 to 45 mph

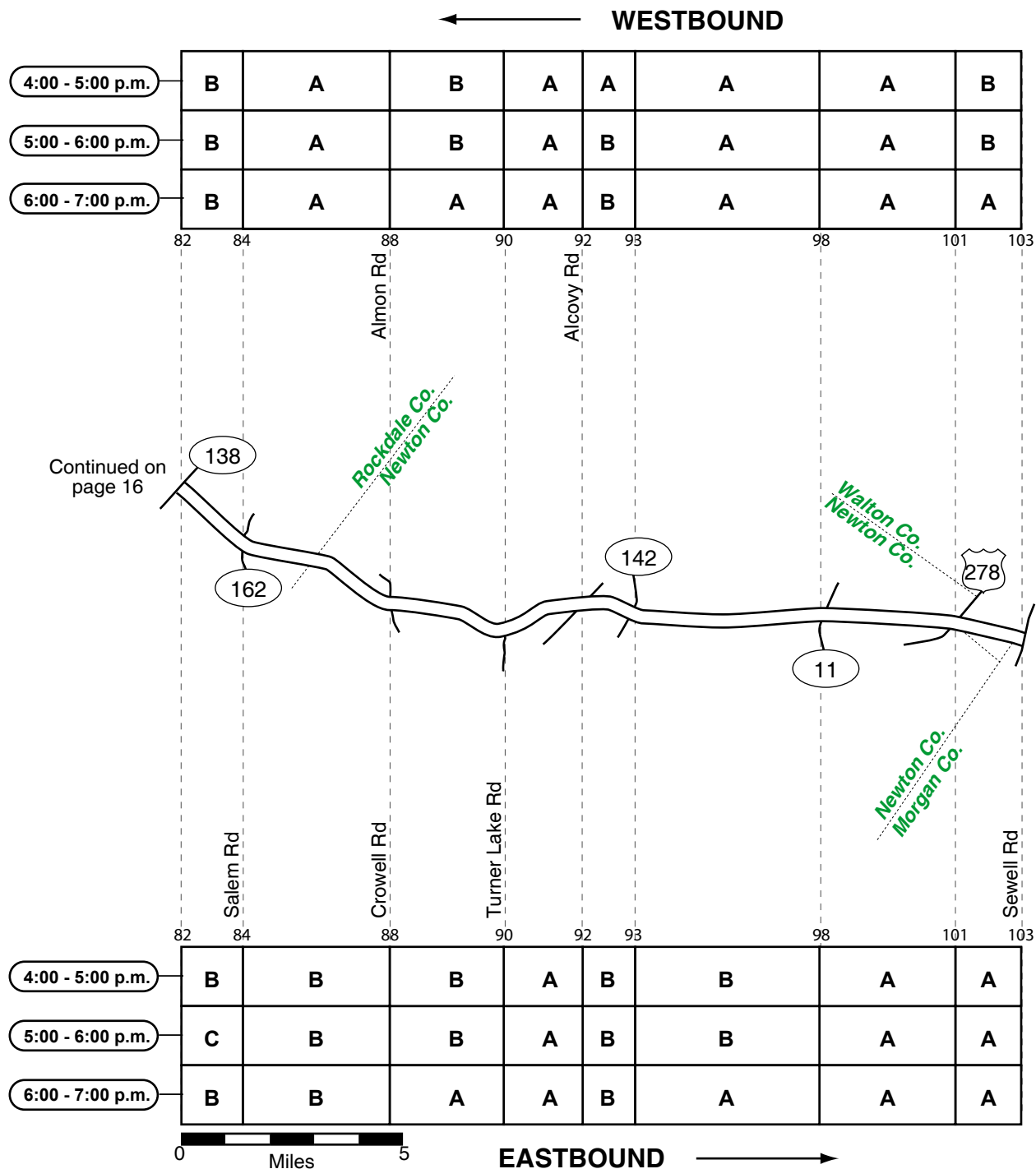
Potential Cause(s): The primary cause of congestion appeared to be the series of lane drops (6 lanes to 3) between I-285 and Wesley Chapel Rd.

I-20 (Rockdale & Newton Counties) - Morning

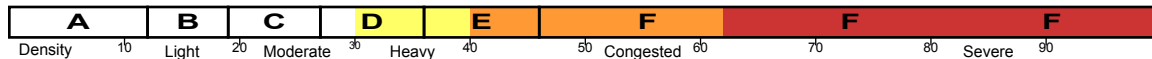
Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

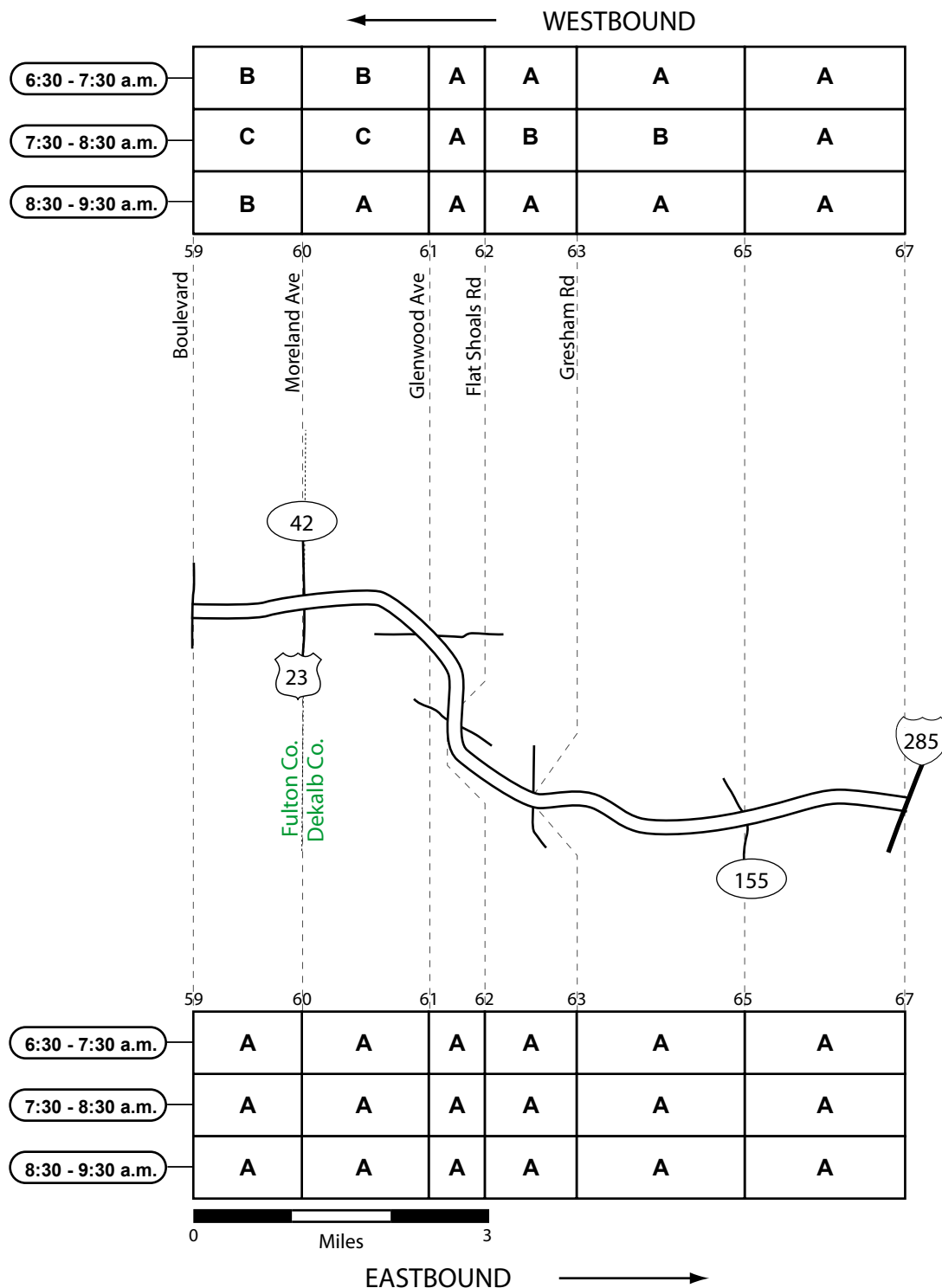
I-20 (Rockdale & Newton Counties) - Evening



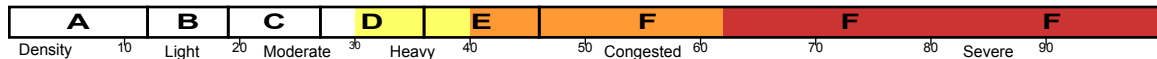
Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

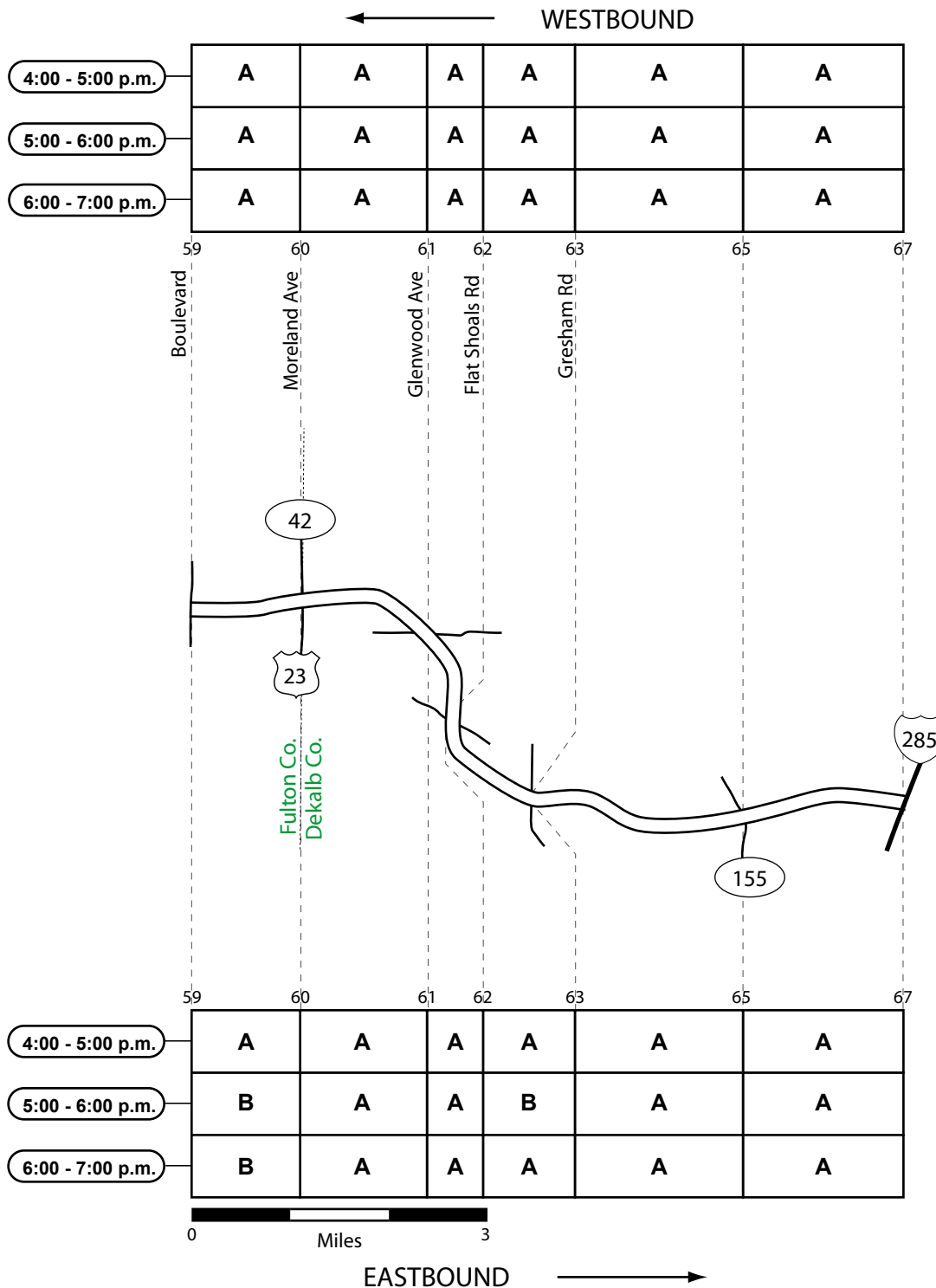
I-20 HOV (Fulton & DeKalb Counties) - Morning



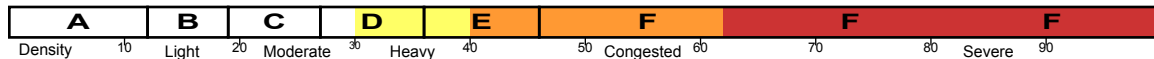
Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

I-20 HOV (Fulton & DeKalb Counties) - Evening



Traffic Quality Rating



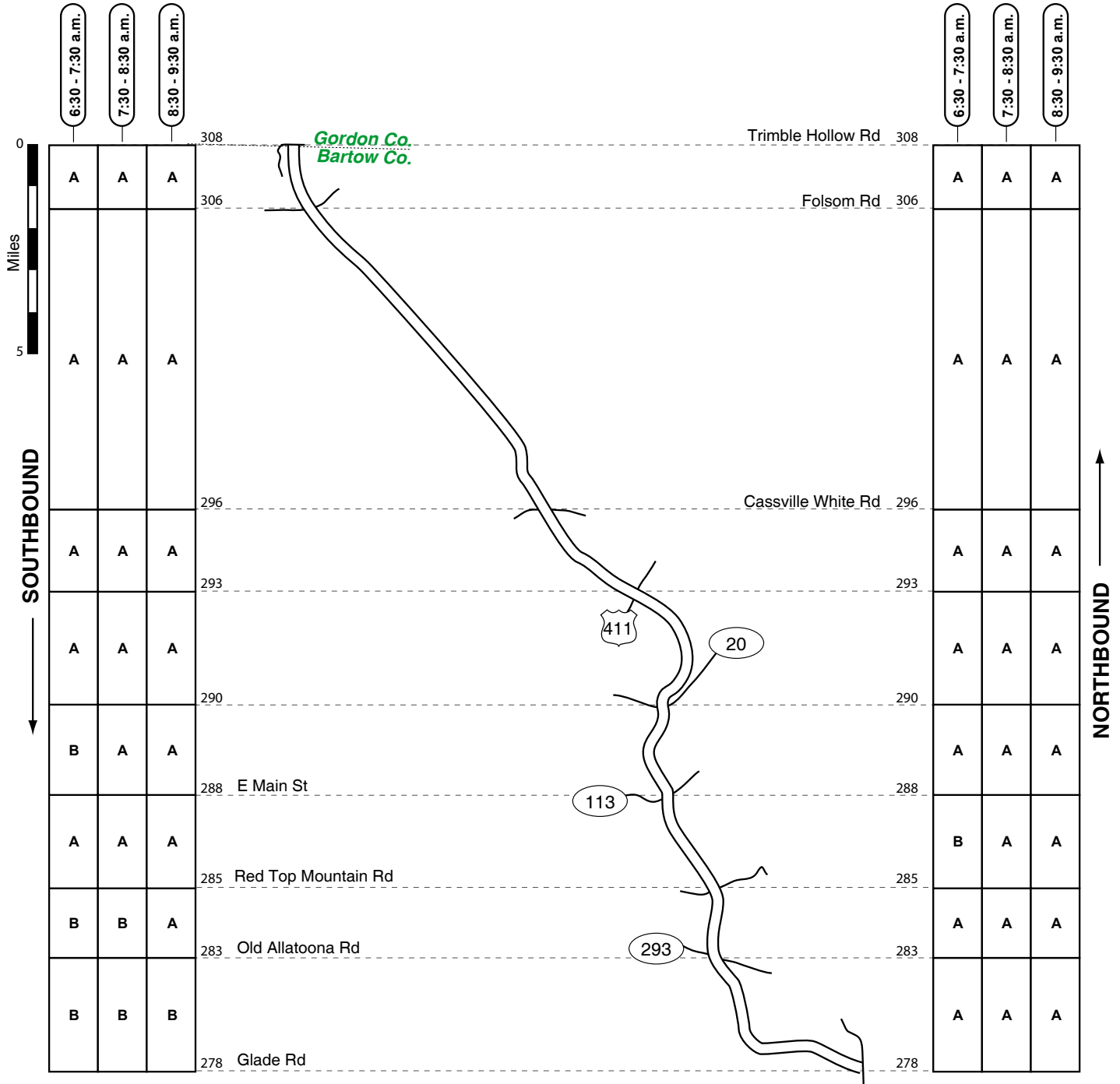
Superscripts: ¹ Type 1 nested congestion (some days, not others).

² Type 2 nested congestion (more severe in left or right-hand lanes).

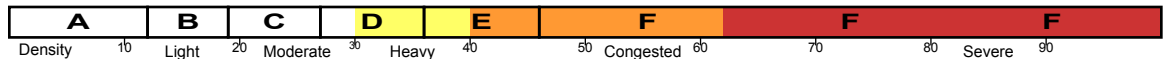
³ Type 3 nested congestion (present only in the first or second half-hour period).

⁴ Type 4 nested congestion (partial length of segment).

I-75 (Bartow County) - Morning



Traffic Quality Rating



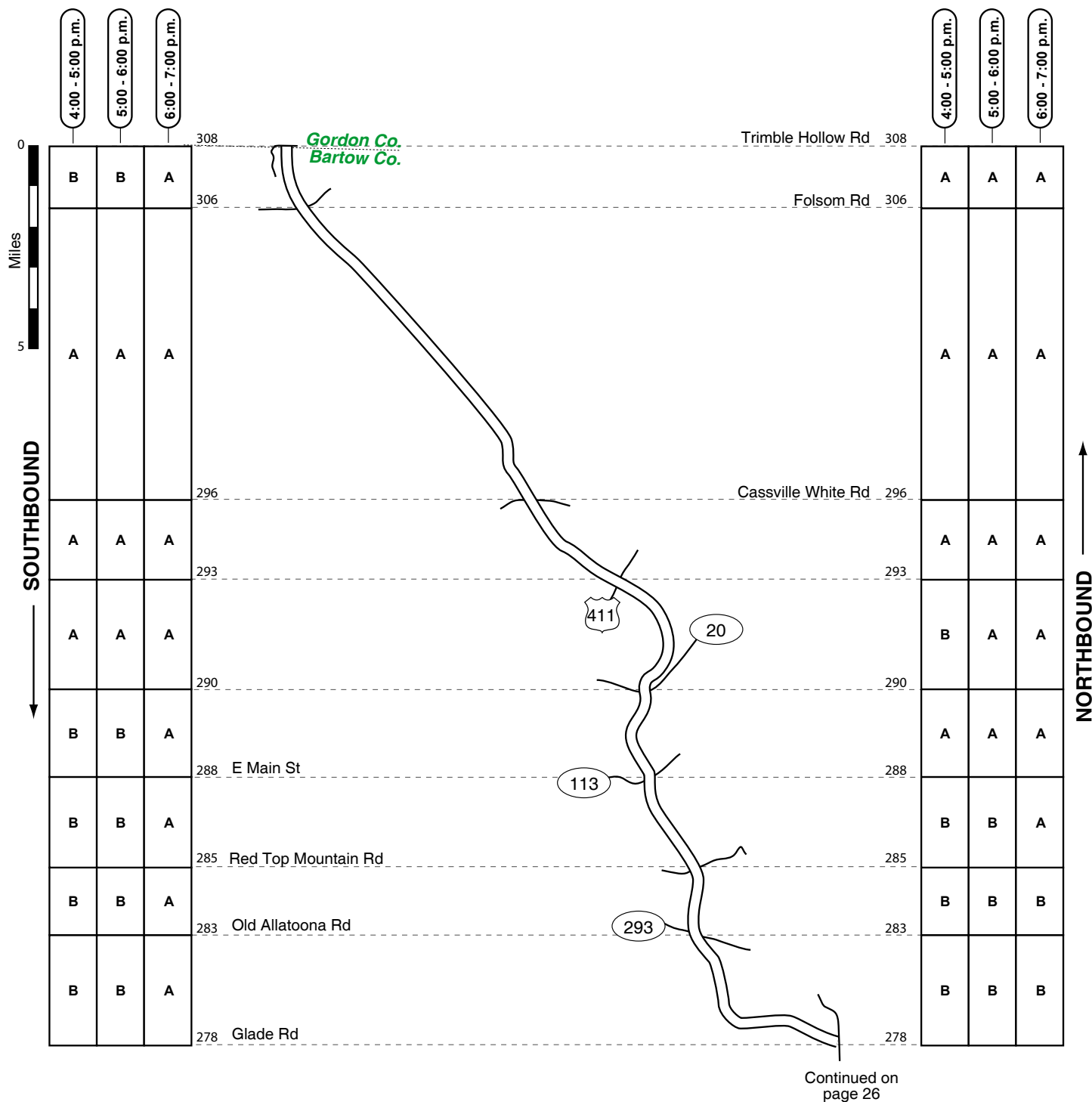
Superscripts: ¹ Type 1 nested congestion (some days, not others).

² Type 2 nested congestion (more severe in left or right-hand lanes).

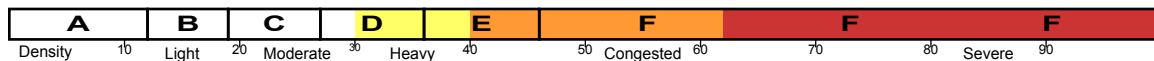
³ Type 3 nested congestion (present only in the first or second half-hour period).

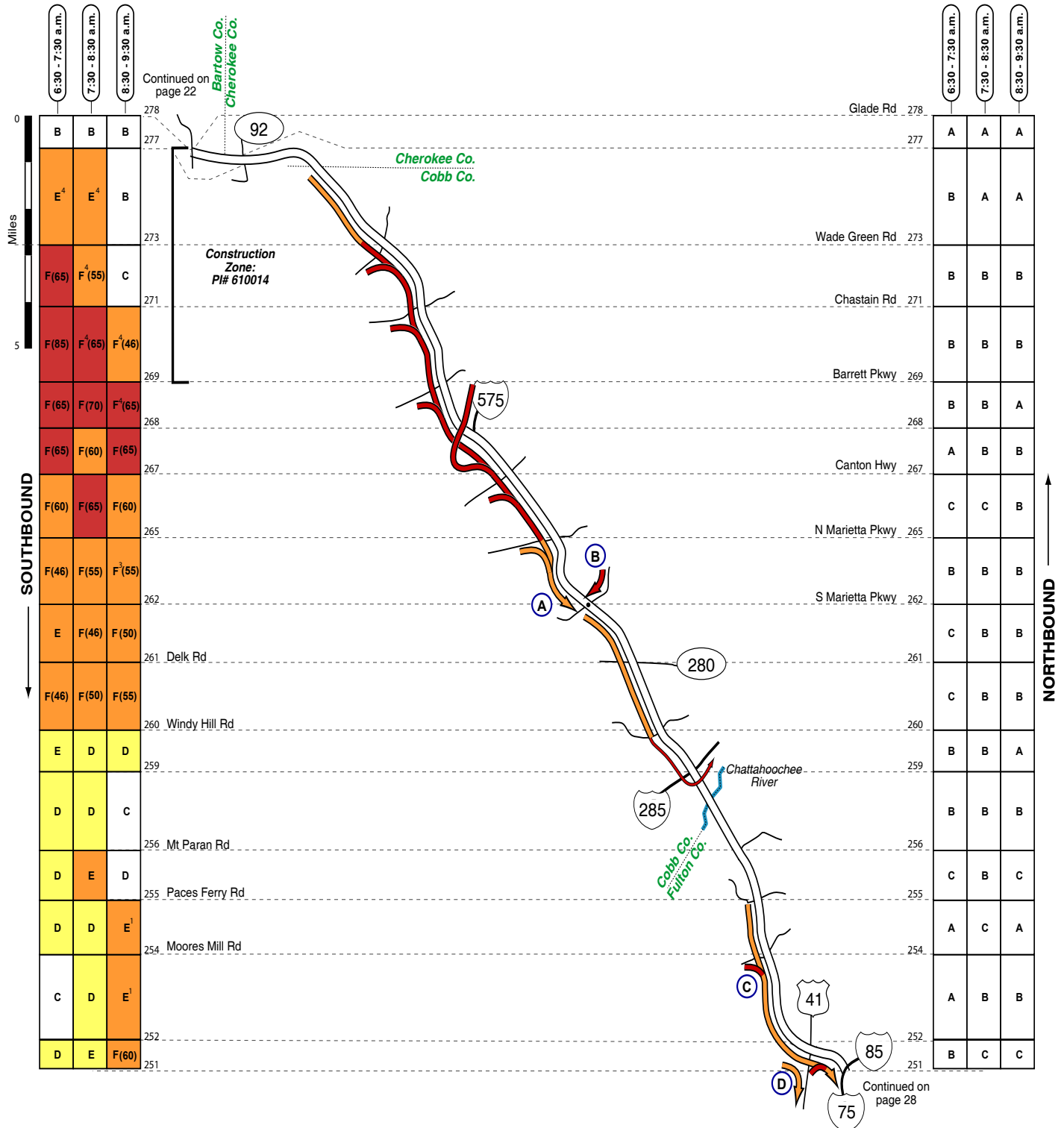
⁴ Type 4 nested congestion (partial length of segment).

I-75 (Bartow County) - Evening



Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

I-75 (Bartow/Cherokee/Cobb & Fulton Counties) - Morning

I-75 (Bartow/Cherokee/Cobb & Fulton Counties) - Morning

A

Congestion Type: Mainline Congestion

Frequency: Most observations

Direction: Southbound

Location: Between SR 92 and I-285

Queue Length: 12 to 14 miles

Estimated Speed: 20 to 50 mph

Potential Cause(s): Factors contributing to the congestion were: 1) traffic entering at the interchanges along this corridor; 2) congestion on the ramp to the Perimeter (Eastbound) extending back into the right two lanes of I-75 and: 3) ongoing construction (lane shift and no shoulders) between Glade Rd and Barrett Parkway.

B

Congestion Type: Congested Cross Road

Location: S. Marietta Parkway

Frequency: Peak Hour

Direction: Westbound

Queue Population: 25 to 35 vpl

Number of Lanes: Two Left-Turn Lanes

C

Congestion Type: Mainline Congestion

Frequency: Most observations after 8:00 a.m.

Direction: Southbound

Location: Between Paces Ferry Rd and I-75 / I-85

Queue Length: 4 to 5 miles

Estimated Speed: 30 to 50 mph

Potential Cause(s): The merging associated with the interchanges along this corridor.

D

Congestion Type: Exit Ramp Queue

Location: SR 3 / US 41

Frequency: Intermittent

Direction: Southbound

Queue Population: 20 to 40 vpl

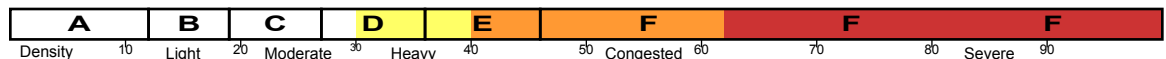
Number of Lanes: One (Right-Turn Lane)

Construction Zone

PI# 610014

Description: Widening/Resurfacing between SR 92 and Barrett Parkway

Traffic Quality Rating

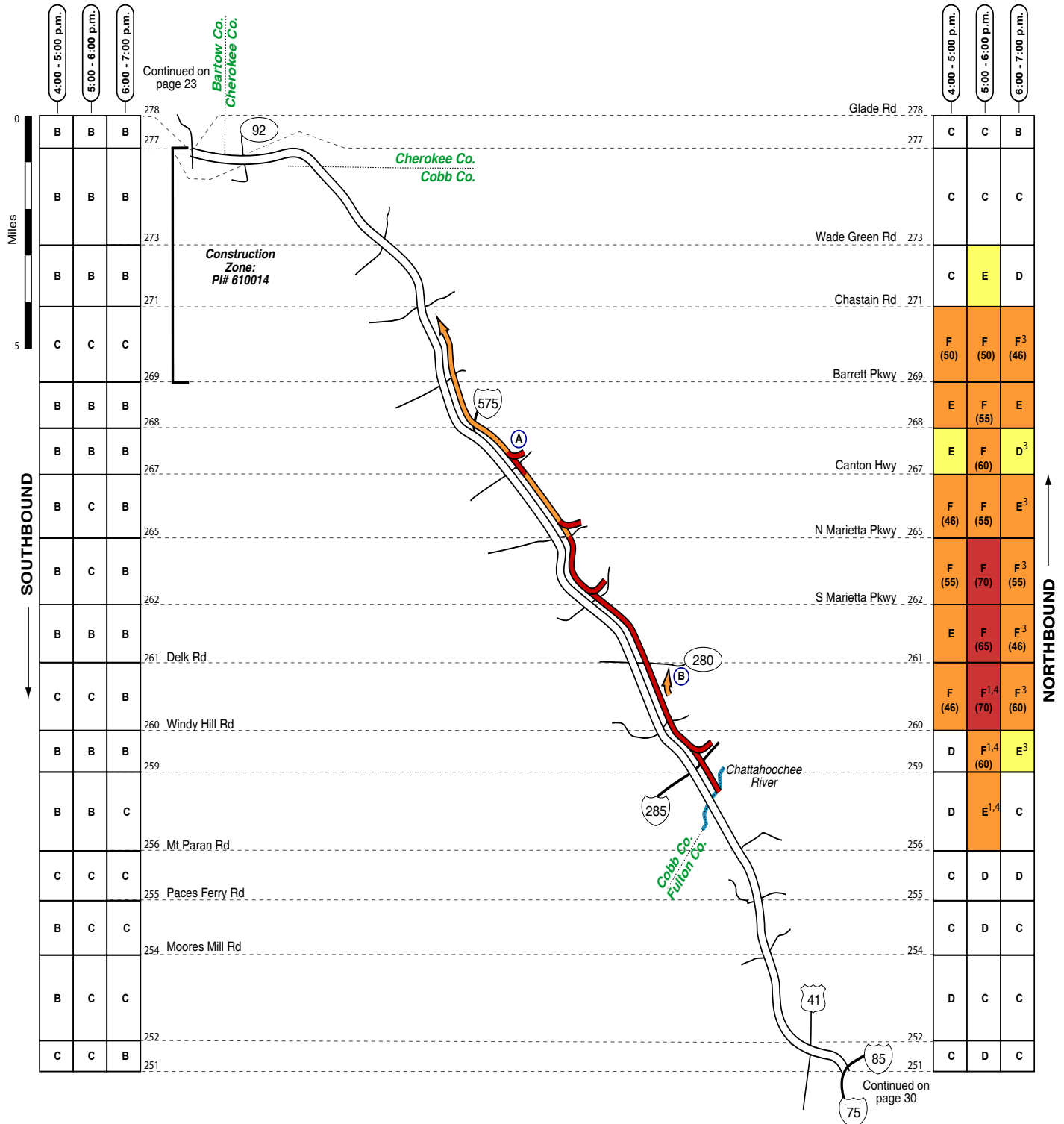


Superscripts: ¹ Type 1 nested congestion (some days, not others).

³ Type 3 nested congestion (present only in the first or second half-hour period).

² Type 2 nested congestion (more severe in left or right-hand lanes).

⁴ Type 4 nested congestion (partial length of segment).

I-75 (Bartow/Cherokee/Cobb & Fulton Counties) - Evening**Superscripts:** ¹ Type 1 nested congestion (some days, not others).² Type 2 nested congestion (more severe in left or right-hand lanes).³ Type 3 nested congestion (present only in the first or second half-hour period).⁴ Type 4 nested congestion (partial length of segment).

I-75 (Bartow/Cherokee/Cobb & Fulton Counties) - Evening

A

Congestion Type: Mainline Congestion

Frequency: Most observations

Direction: Northbound

Location: Between the Perimeter and Chastain Rd

Queue Length: 12 to 14 miles

Estimated Speed: 25 to 50 mph

Potential Cause(s): Factors contributing to the congestion were: 1) the two separate lane drops at I-575 (6 lanes to 4) and Barrett Pkwy (4 lanes to 3); 2) merging associated the Perimeter, Marietta Parkway (North and South), Canton Rd Connector and I-575 interchanges and; 3) ongoing construction (lane shift and no shoulders) between Barrett Parkway and Glade Rd.

B

Congestion Type: Exit Ramp Queue

Location: SR 280

Frequency: Intermittent

Direction: Northbound

Queue Population: 20 to 30 vpl

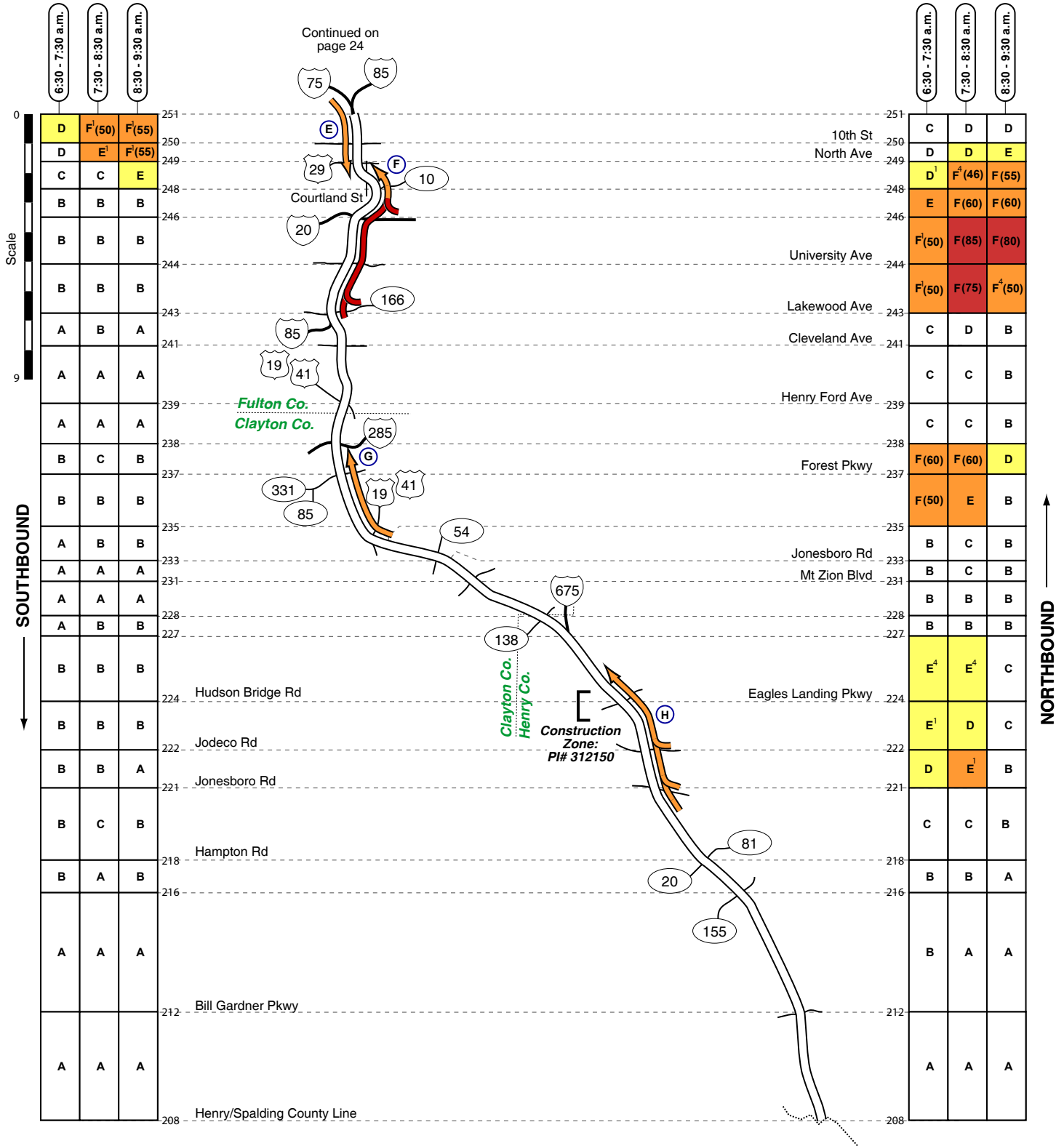
Number of Lanes: One

Construction Zone

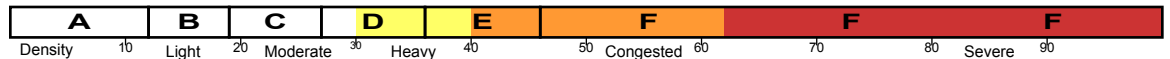
PI# 610014

Description: Widening/Resurfacing between Barrett Parkway and SR 92

I-75 (Fulton/Clayton & Henry Counties) - Morning



Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

I-75 (Fulton/Clayton & Henry Counties) - Morning

E

Congestion Type: Mainline Congestion

Frequency: Most observations after 7:30 a.m.

Direction: Southbound

Location: Between the I-75/I-85 merge and SR 10

Queue Length: 1 to 2 miles

Estimated Speed: 25 to 50 mph

Potential Cause(s): Traffic exiting at Williams St and Courtland St.

F

Congestion Type: Mainline Congestion

Frequency: Most observations

Direction: Northbound

Location: Between SR 166 and US 29

Queue Length: 4 to 5 miles

Estimated Speed: 20 to 40 mph

Potential Cause(s): Factors contributing to the congestion were: 1) traffic entering at the SR 166 and I-20 interchanges and; 2) the two separate lane drops approaching the I-20 interchange (6 lanes to 5 and 5 lanes to 4).

G

Congestion Type: Mainline Congestion

Frequency: Most observations before 8:30 a.m.

Direction: Northbound

Location: Between US 19/41 and I-285

Queue Length: 3 to 4 miles

Estimated Speed: 30 to 50 mph

Potential Cause(s): The merging associated with the interchanges along this section of I-75.

H

Congestion Type: Mainline Congestion

Frequency: Most observations before 8:00 a.m.

Direction: Northbound

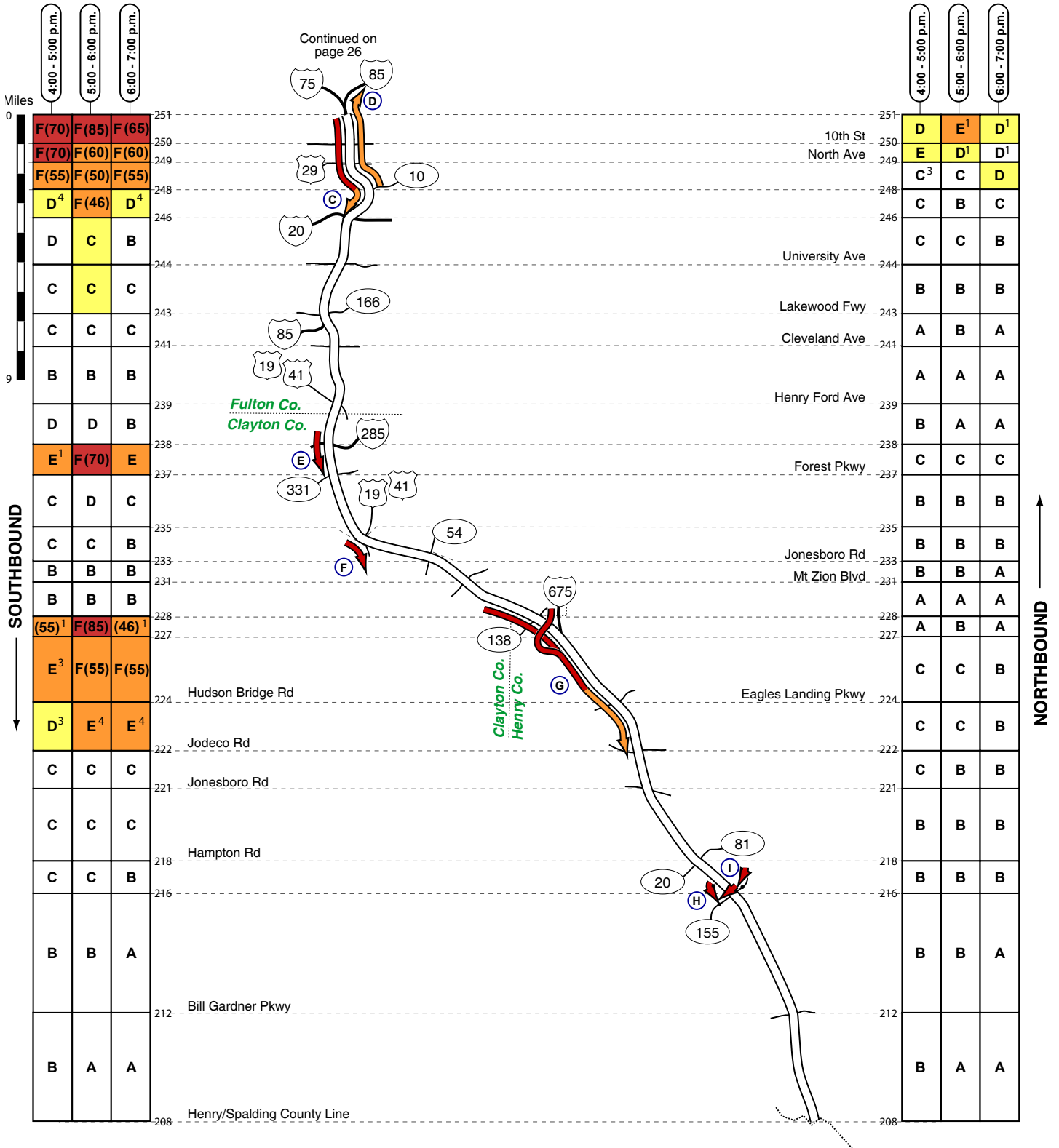
Location: Between Jonesboro Rd and I-675

Queue Length: 4 to 5 miles

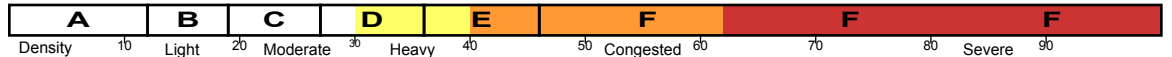
Estimated Speed: 30 to 50 mph

Potential Cause(s): Traffic entering at the Jodeco Rd and Jonesboro Rd interchanges.

I-75 (Fulton/Clayton & Henry Counties) - Evening



Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

I-75 (Fulton/Clayton & Henry Counties) - Evening

C

Congestion Type: Mainline Congestion

Frequency: Most observations

Direction: Southbound

Location: Between I-75/I-85 and I-20

Queue Length: 2 to 3 miles

Estimated Speed: 15 to 45 mph

Potential Cause(s): Factors contributing to the congestion were: 1) the geometrics of the road (sharp bends) and: 2) merging associated with the interchanges along this corridor.

D

Congestion Type: Mainline Congestion

Frequency: Peak Hour

Direction: Northbound

Location: Between SR 10 and I-75/I-85

Queue Length: 1 to 2 miles

Estimated Speed: 40 to 50 mph

Potential Cause(s): Weaving associated with the I-75/I-85 Interchange

E

Congestion Type: Mainline Congestion

Frequency: Most observations before 6:30 p.m.

Direction: Southbound

Location: Between I-285 and Forest Parkway

Queue Length: 1 to 2 miles

Estimated Speed: 25 to 50 mph

Potential Cause(s): Factors contributing to the congestion were: 1) the lane drops (5 lanes to 4 and 4 lanes to 3) in the vicinity of the I-285 interchange and; 2) traffic entering from I-285.

F

Congestion Type: Exit Ramp Queue

Location: US 19 / US 41

Frequency: Peak Hour

Direction: Southbound

Queue Population: 20 to 30 vpl

Number of Lanes: Three

G

Congestion Type: Mainline Congestion

Frequency: Most observations

Direction: Southbound

Location: Between SR 138 and Jodeco Rd

Queue Length: 5 to 6 miles

Estimated Speed: 15 to 50 mph

Potential Cause(s): Traffic entering at the I-675 and Hudson Bridge Rd

H

Congestion Type: Exit Ramp Queue

Location: SR 155

Frequency: Peak Hour

Direction: Southbound

Queue Population: 20 to 30 vpl

Number of Lanes: One Left-Turn Lane

I

Congestion Type: Congested Cross Road

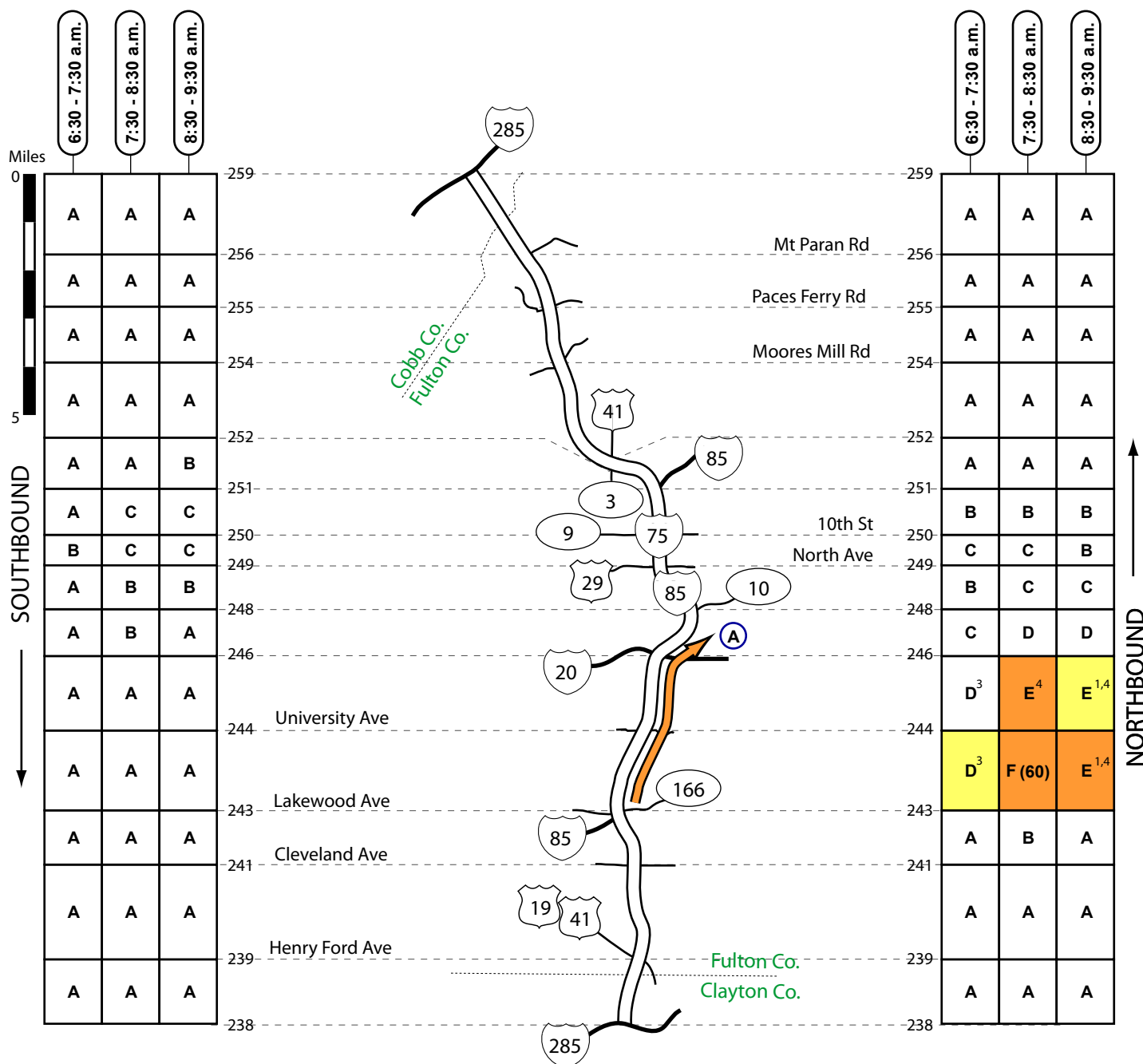
Location: SR 155

Frequency: Peak Hour

Direction: Westbound

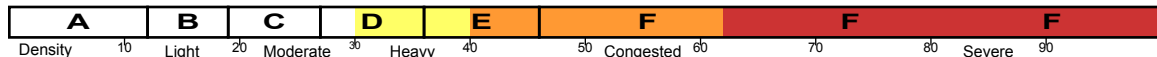
Queue Population: 40 to 50 vpl

Number of Lanes: One

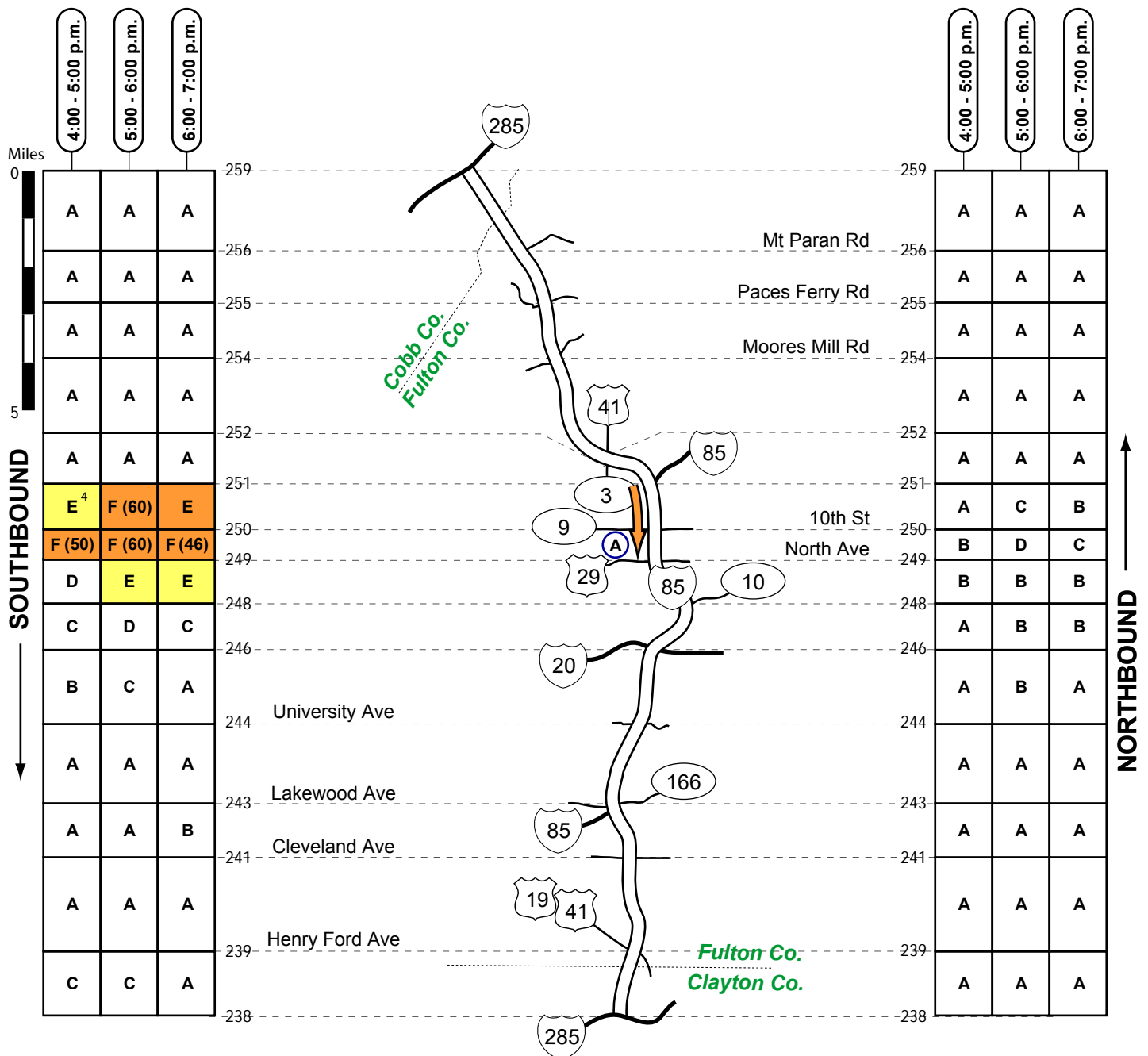
I-75 HOV (Cobb/Fulton & Clayton Counties) - Morning

A
 Congestion Type: Mainline Congestion
 Frequency: Most observations
 Direction: Northbound
 Location: Between SR 166 and I-20
 Queue Length: 3 to 4 miles
 Estimated Speed: 25 to 50 mph
 Potential Cause(s): Friction between the congested "general-purpose" lanes and the HOV facility

Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

I-75 HOV (Cobb/Fulton & Clayton Counties) - Evening



A

Congestion Type: Mainline Congestion

Frequency: Most observations

Direction: Southbound

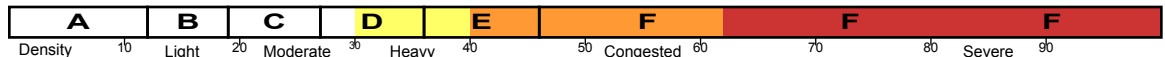
Location: Between I-75/I-85 and SR 10

Queue Length: 1 to 2 miles

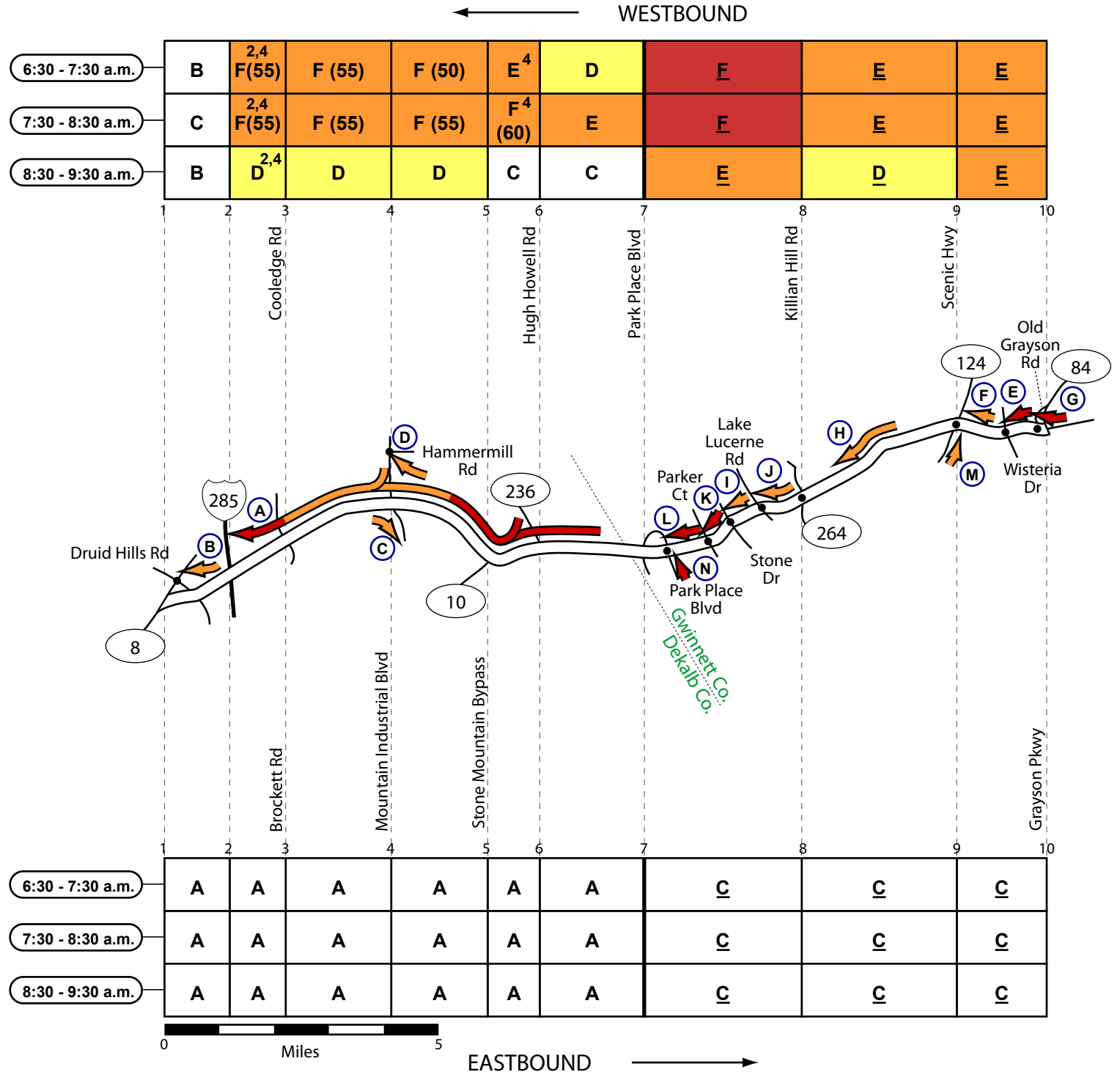
Estimated Speed: 30 to 50 mph

Potential Cause(s): Friction between the congested "general-purpose" lanes and the HOV Facility

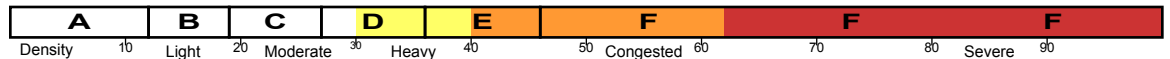
Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

US 78 (DeKalb & Gwinnett Counties) - Morning



Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

US 78 (DeKalb & Gwinnett Counties) - Morning

A

Congestion Type: Mainline Congestion
 Frequency: Most observations before 9:00 a.m.
 Direction: Westbound
 Location: Between Park Place Blvd and I-285
 Queue Length: 5 to 8 miles
 Estimated Speed: 20 to 50 mph
 Potential Cause(s): Factors contributing to the congestion included: 1) congestion on the ramp to northbound I-285 backed into the right two lanes on US 78 and ultimately across all three lanes; 2) traffic entering the mainline at Stone Mountain Industrial Blvd and SR 10 (Stone Mountain Blvd).

B

Congestion Type: Exit Ramp Queue
 Location: Druid Hills Rd
 Frequency: Intermittent
 Direction: Westbound
 Queue Population: 20 to 45 vpl
 Number of Lanes: Two
 Note: When congested, the head of the ramp queue was found on westbound Druid Hills Rd at the signal at SR 8.

C

Congestion Type: Exit Ramp Queue
 Location: Mountain Industrial Blvd
 Frequency: Intermittent
 Direction: Eastbound
 Queue Population: 20 to 25 vpl
 Number of Lanes: Two
 Note: When congested, vehicles were queued in the left two lanes at the signal at the head of the ramp.

D

Congestion Type: Exit Ramp Queue
 Location: Mountain Industrial Blvd
 Frequency: Intermittent
 Direction: Westbound
 Queue Population: 20 to 25 vpl
 Number of Lanes: One
 Note: When congested, vehicles were queued in the right lane on the ramp waiting to turn northbound on Mountain Industrial Blvd; the head of the queue was found on Mountain Industrial Blvd at the signal at Hammermill Rd.

E

Congestion Type: Signal Queue
 Location: Wisteria Dr
 Frequency: Most observations
 Direction: Westbound
 Queue Populations: 20 to 40 vpl
 Number of Lanes: 2

F

Congestion Type: Signal Queue
 Location: SR 124
 Frequency: Intermittent
 Direction: Westbound
 Queue Populations: 20 to 25 vpl
 Number of Lanes: 2

G

Congestion Type: Signal Queue
 Location: Old Grayson Rd
 Frequency: Most observations
 Direction: Westbound
 Queue Populations: 20 to 60 vpl
 Number of Lanes: 2

H

Congestion Type: Platoons
 Location: Between SR 124 & SR 264
 Frequency: Intermittent
 Direction: Westbound
 Platoon Populations: 25 to 35 vpl
 Number of Lanes: 2

I

Congestion Type: Signal Queue
 Location: Stone Dr
 Frequency: Intermittent
 Direction: Westbound
 Queue Populations: 20 to 35 vpl
 Number of Lanes: 3

J

Congestion Type: Signal Queue
 Location: Lake Lucerne Rd
 Frequency: Intermittent
 Direction: Westbound
 Queue Populations: 20 to 25 vpl
 Number of Lanes: 3

K

Congestion Type: Signal Queue
 Location: Parker Ct
 Frequency: Most observations
 Direction: Westbound
 Queue Populations: 35 to 50 vpl
 Number of Lanes: 3

L

Congestion Type: Signal Queue
 Location: Park Place Blvd
 Frequency: Most observations
 Direction: Westbound
 Queue Populations: 20 to 50 vpl
 Number of Lanes: 3

M

Congestion Type: Congested Cross Road
 Location: SR 124
 Frequency: Intermittent
 Direction: Northbound
 Queue Populations: 20 to 30 vpl
 Number of Lanes: 3

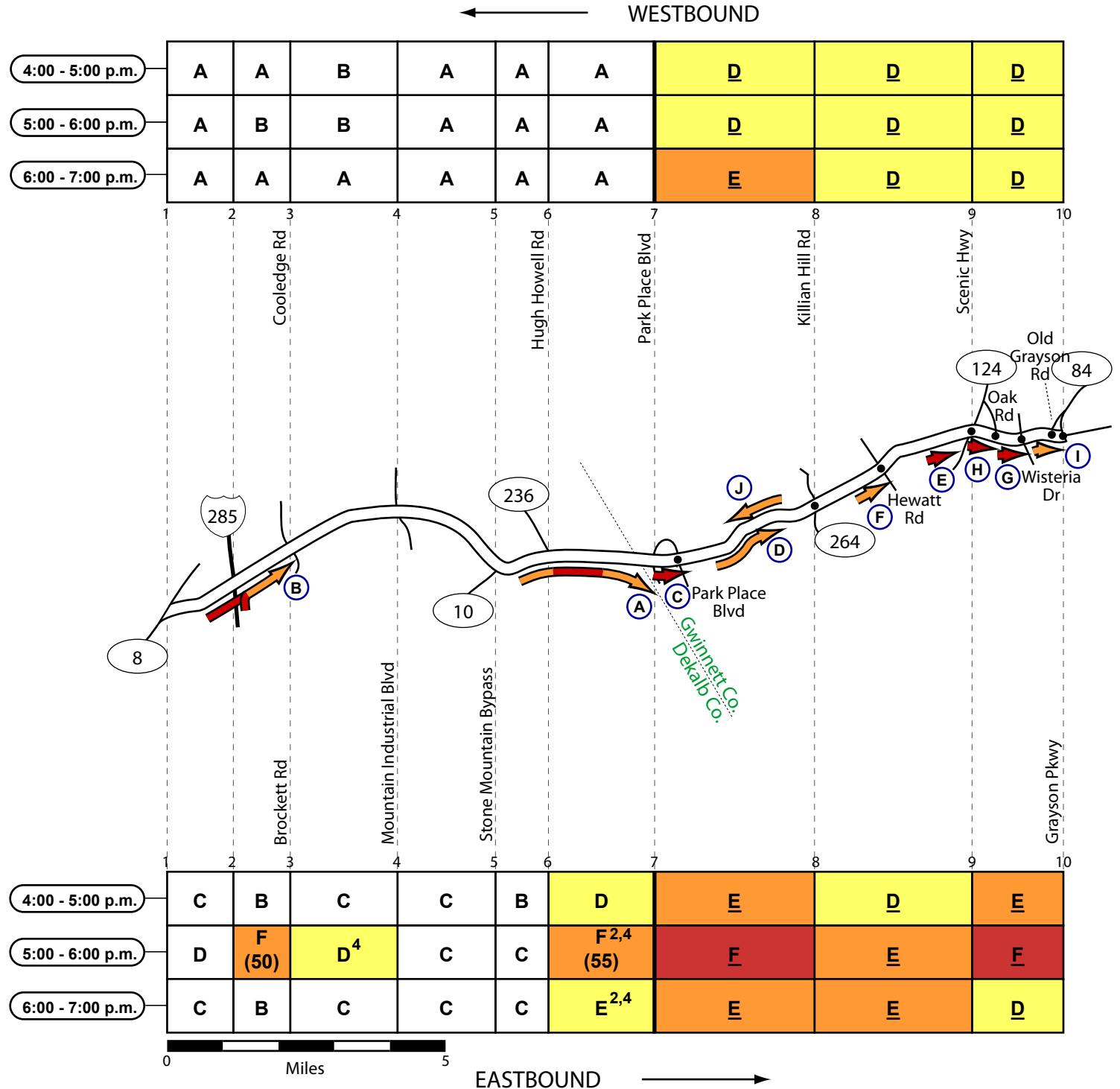
N

Congestion Type: Congested Cross Road
 Location: Park Place Blvd
 Frequency: Most observations
 Direction: Northbound
 Queue Populations: 20 to 40 vpl
 Number of Lanes: 2
 Note: During some observations, congestion extended back through the upstream signal at Rockbridge Rd.

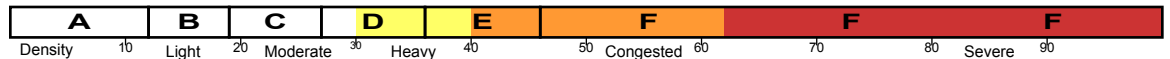
Traffic Quality Rating

| A | B | C | D | E | F |
|------------|-------|----------|-------|-----------|--------|
| Very Light | Light | Moderate | Heavy | Congested | Severe |

US 78 (DeKalb & Gwinnett Counties) - Evening



Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

US 78 (DeKalb & Gwinnett Counties) - Evening

A

Congestion Type: Mainline Congestion
 Frequency: Most observations after 5:00 p.m.
 Direction: Eastbound
 Location: Between SR 236 and Park Place Blvd
 Queue Length: 1 to 2 miles
 Estimated Speed: 30 to 50 mph
 Potential Cause(s): Congestion appeared to be exacerbated by vehicles exiting at the service road approximately one-half mile before the Park Place Blvd interchange; weaving on the approach to the exit ramp may have contributed to the congestion.

B

Congestion Type: Mainline Congestion
 Frequency: Most observations between 5:00 and 6:00 p.m.
 Direction: Eastbound
 Location: Between I-285 and Cooledge Rd
 Queue Length: 1 to 1.5 miles
 Estimated Speed: 20 to 50 mph
 Potential Cause(s): Congestion appeared to be caused by traffic entering the mainline from northbound I-285 and the lane drop (4 lanes to 3) at Cooledge Rd.

C

Congestion Type: Signal Queue
 Location: Park Place Blvd
 Frequency: Most observations
 Direction: Eastbound
 Queue Populations: 20 to 40 vpl
 Number of Lanes: 2

D

Congestion Type: Platoons
 Location: Between E. Park Place Blvd & SR 264
 Frequency: Most observations
 Direction: Eastbound
 Platoon Populations: 25 to 40 vpl
 Number of Lanes: 3

E

Congestion Type: Signal Queue
 Location: SR 124
 Frequency: Most observations
 Direction: Eastbound
 Queue Populations: 20 to 40 vpl
 Number of Lanes: 2

F

Congestion Type: Signal Queue
 Location: Hewatt Rd
 Frequency: Intermittent
 Direction: Eastbound
 Queue Populations: 20 to 30 vpl
 Number of Lanes: 2

G

Congestion Type: Signal Queue
 Location: Wisteria Dr
 Frequency: Most observations
 Direction: Eastbound
 Queue Populations: 20 to 45 vpl
 Number of Lanes: 2

H

Congestion Type: Signal Queue
 Location: Oak Rd
 Frequency: Most observations
 Direction: Eastbound
 Queue Populations: 20 to 35 vpl
 Number of Lanes: 2

I

Congestion Type: Signal Queue
 Location: Old Grayson Rd
 Frequency: Intermittent
 Direction: Eastbound
 Queue Populations: 20 to 30 vpl
 Number of Lanes: 2

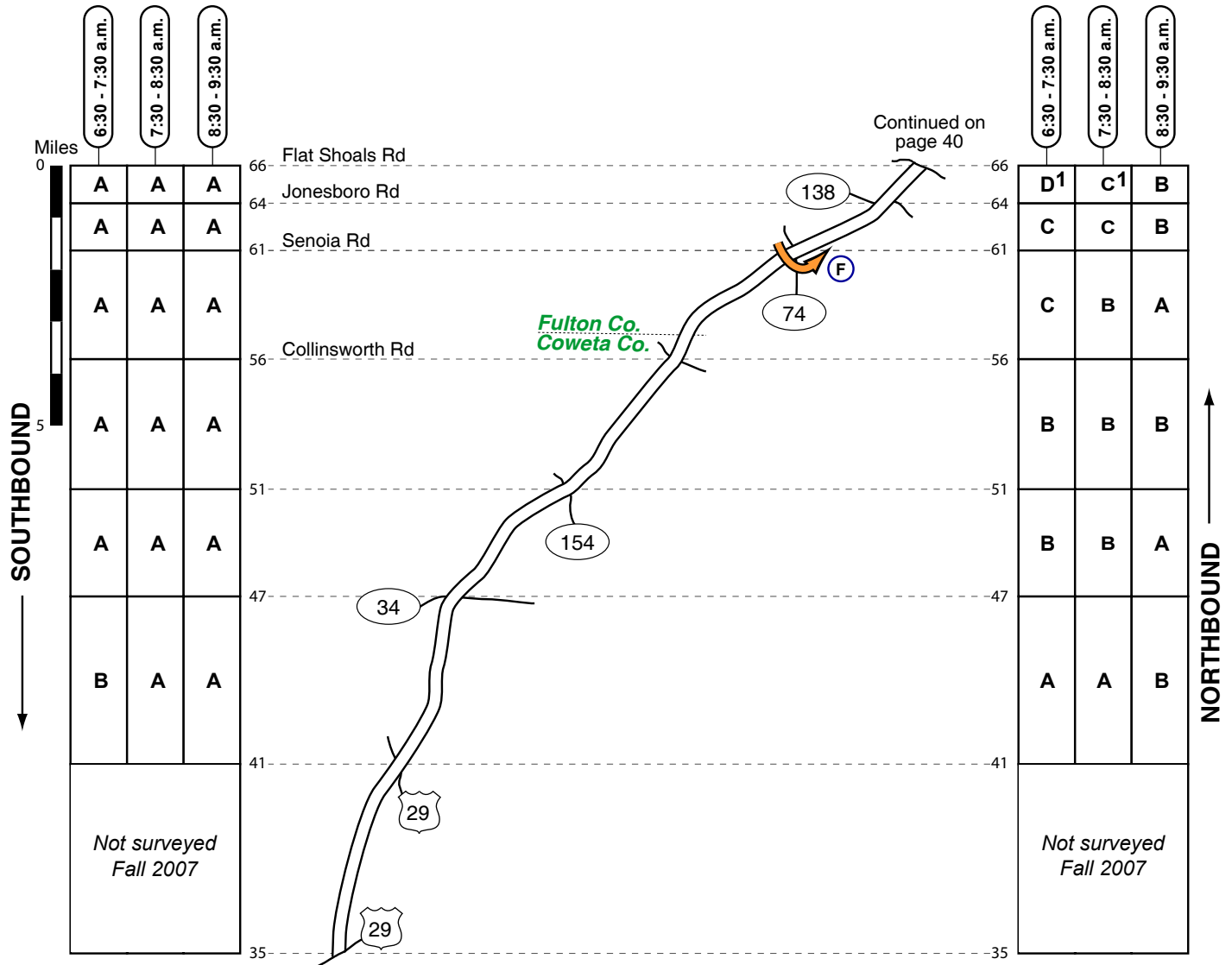
J

Congestion Type: Platoons
 Location: Between Killian Hill Rd and Park Place Blvd
 Frequency: Intermittent
 Direction: Westbound
 Queue Populations: 25 to 30 vpl
 Number of Lanes: 2

Traffic Quality Rating

| A | B | C | D | E | F |
|------------|-------|----------|-------|-----------|--------|
| Very Light | Light | Moderate | Heavy | Congested | Severe |

I-85 (Fulton & Coweta Counties) - Morning



F

Congestion Type: Entrance Ramp Queue

Location: SR 74 (Senoia Rd)

Frequency: Intermittent

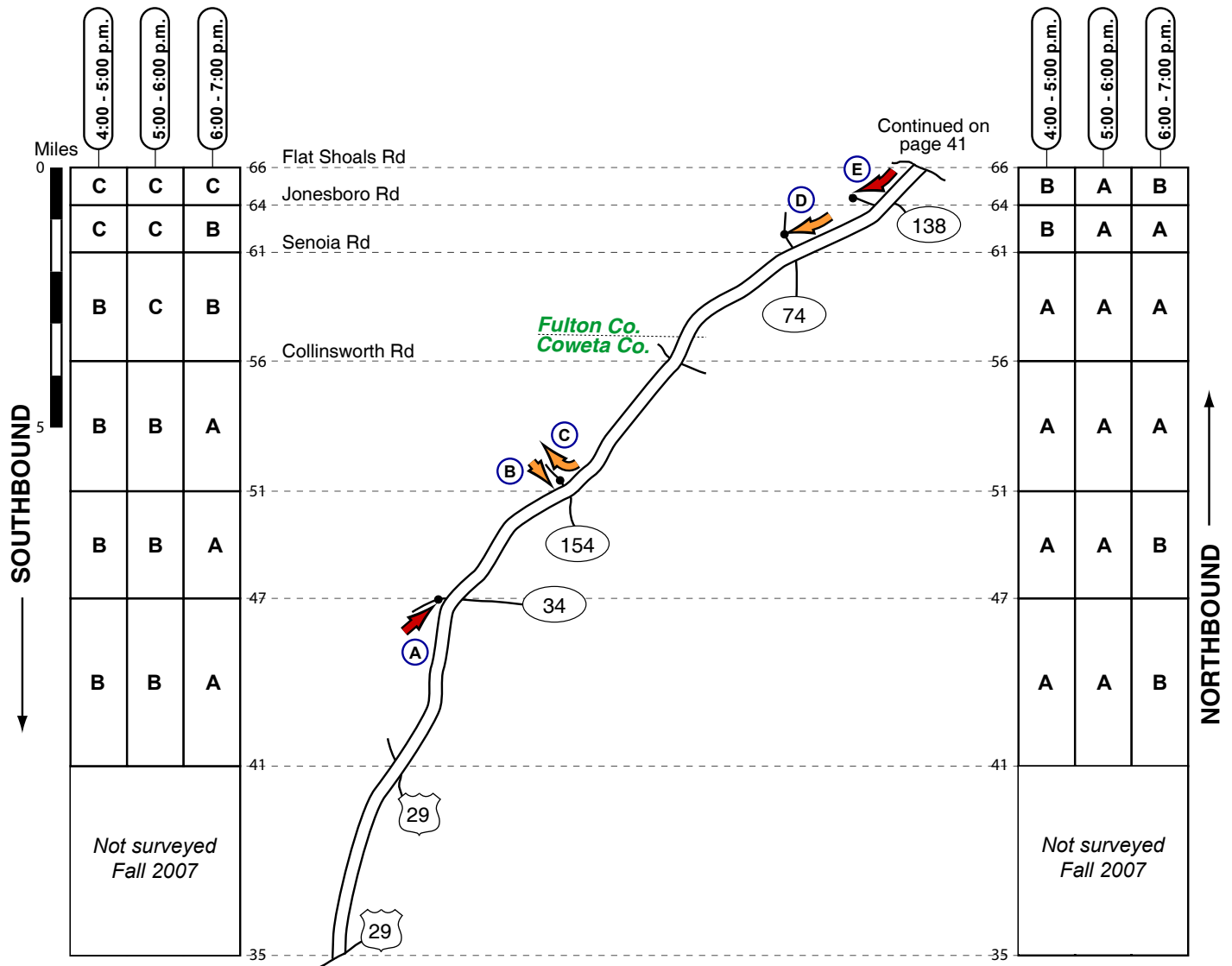
Direction: Northbound

Queue Population: 20 to 40 vpl

Number of Lanes: One

Note: In some cases, congestion on the entrance ramp appeared to back through the signal on SR 74; congestion was intermittently found in the left lane (eastbound) on SR 74 approaching the signal at the northbound ramp.

I-85 (Fulton & Coweta Counties) - Evening



A
 Congestion Type: Congested Cross Road
 Location: SR 34
 Frequency: Peak Hour
 Direction: Eastbound
 Queue Population: 20 to 30 vpl
 Number of Lanes: Three

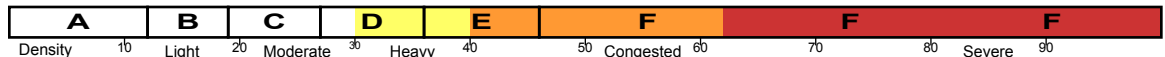
B
 Congestion Type: Congested Cross Road
 Location: SR 154
 Frequency: Intermittent
 Direction: Eastbound
 Queue Population: 20 to 30 vpl
 Number of Lanes: One

C
 Congestion Type: Exit Ramp Queue
 Location: SR 154
 Frequency: Intermittent
 Direction: Southbound
 Queue Population: 20 to 30 vpl
 Number of Lanes: One (Left-Turn Lane)

D
 Congestion Type: Exit Ramp Queue
 Location: SR 74
 Frequency: Intermittent
 Direction: Southbound
 Queue Population: 20 to 30 vpl
 Number of Lanes: Two (Left-Turn Lanes)
 Note: Intermittently, congestion on the ramp extended back into the right lane of I-85.

E
 Congestion Type: Exit Ramp Queue
 Location: SR 138
 Frequency: Peak Hour
 Direction: Southbound
 Queue Population: 40 to 60 vpl
 Number of Lanes: One
 Note: The signal at the head of the ramp did not appear to be the capacity constraint.

Traffic Quality Rating



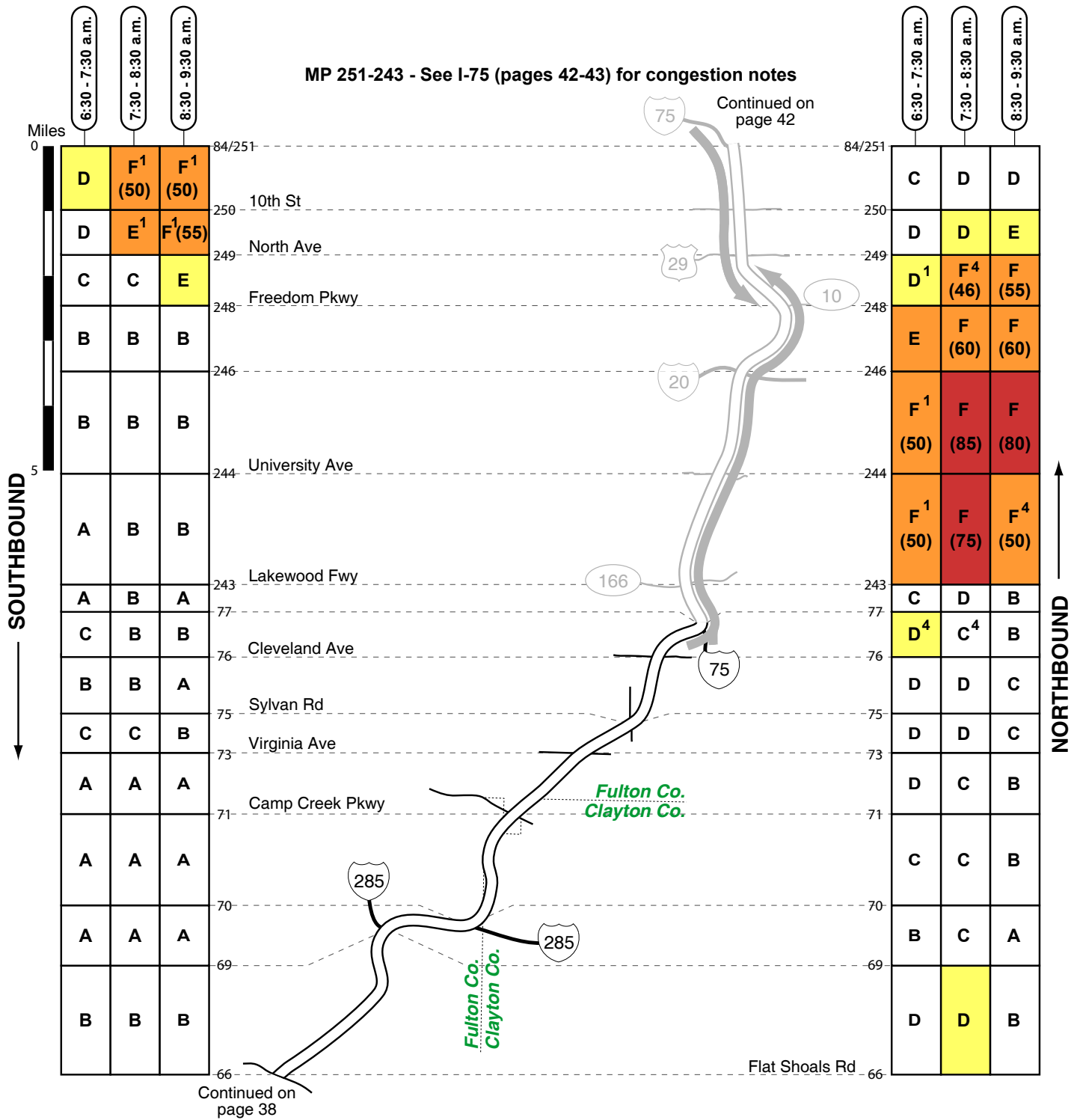
Superscripts: ¹ Type 1 nested congestion (some days, not others).

² Type 2 nested congestion (more severe in left or right-hand lanes).

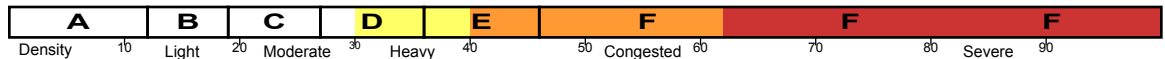
³ Type 3 nested congestion (present only in the first or second half-hour period).

⁴ Type 4 nested congestion (partial length of segment).

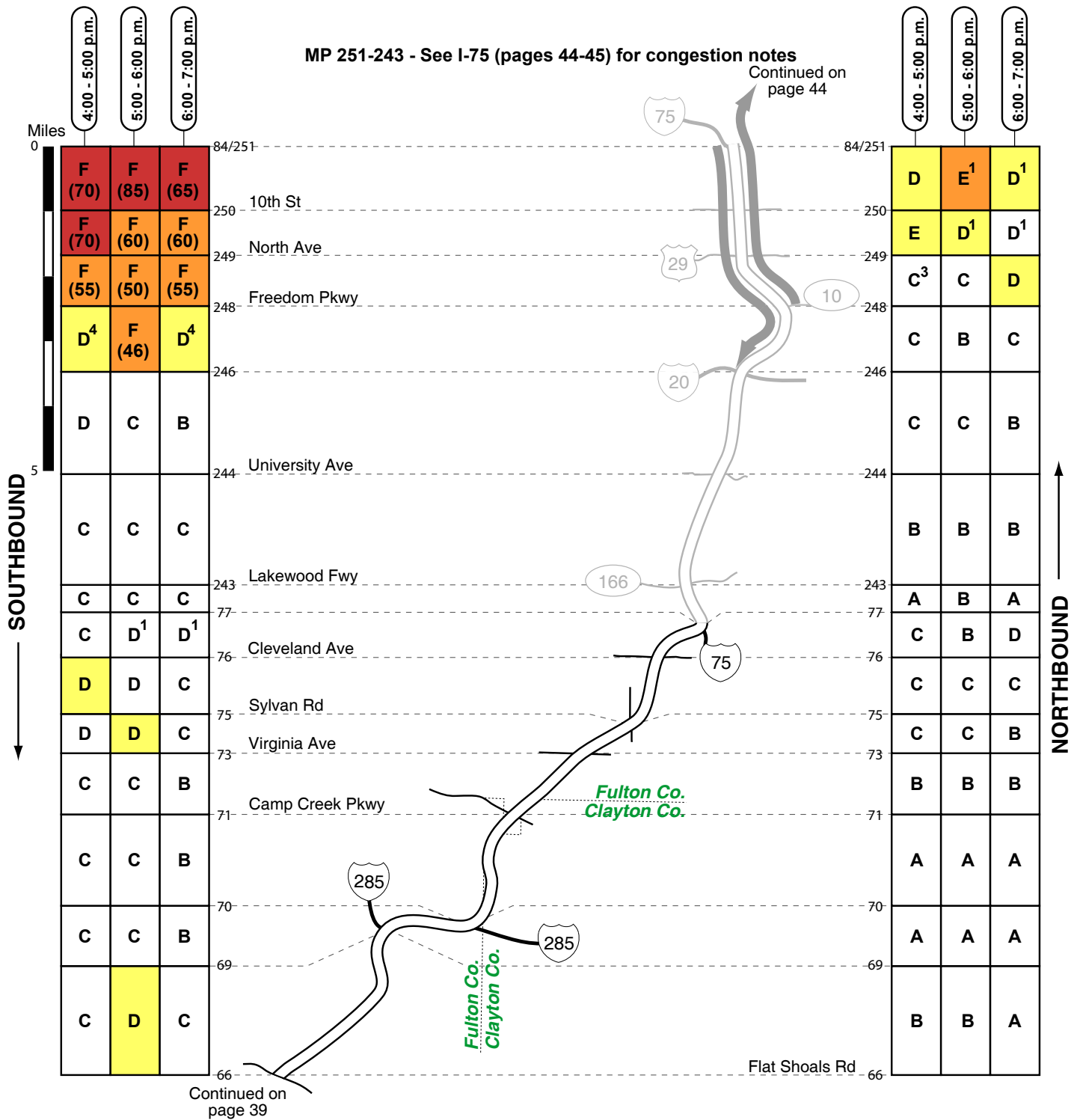
I-85 (Fulton & Clayton Counties) - Morning



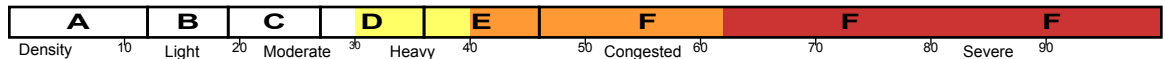
Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

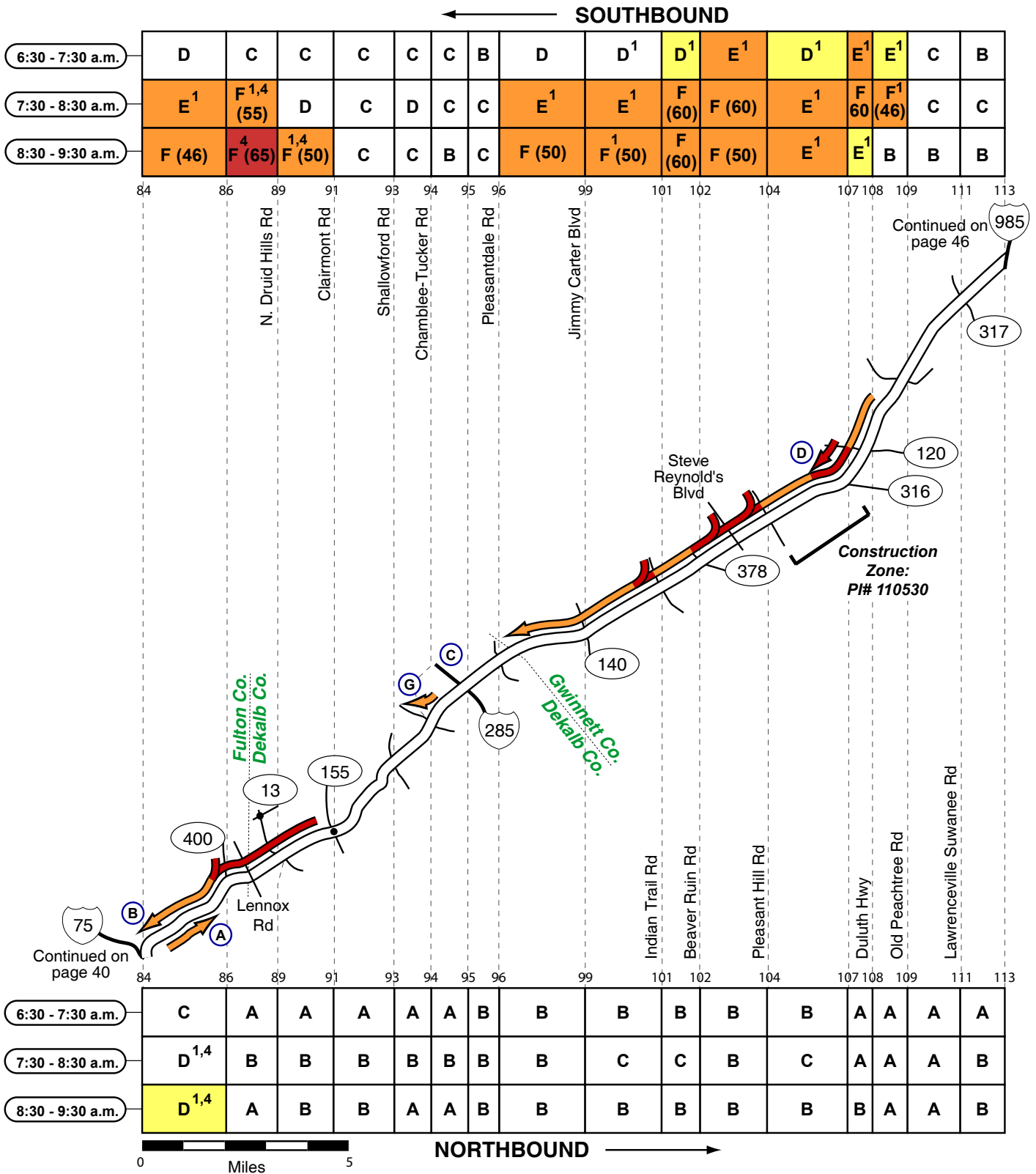
I-85 (Fulton & Clayton Counties) - Evening



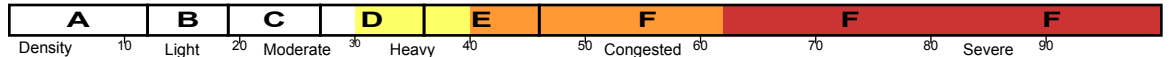
Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

I-85 (Fulton/Dekalb & Gwinnett Counties) - Morning



Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

I-85 (Fulton/Dekalb & Gwinnett Counties) - Morning

A

Congestion Type: Mainline Congestion

Frequency: Intermittent

Direction: Northbound

Location: Between I-75 and SR 400

Queue Length: 0.5 to 1.5 miles

Estimated Speed: 40 to 50 mph

Potential Cause(s): Factors that may have exacerbated the congestion included: 1) the lane drop (5 lanes to 4) at Buford Hwy; 2) sun glare.

B

Congestion Type: Mainline Congestion

Frequency: Most observations after 7:30 a.m.

Direction: Southbound

Location: Between SR 155 (Clairmont Rd) and I-75

Queue Length: 3 to 6 miles

Estimated Speed: 15 to 50 mph

Potential Cause(s): The primary bottleneck along this section of I-85 was found where traffic entered the mainline at SR 400; upstream of the merge, average estimated speeds were typically less than 30 mph. While congestion persisted south of SR 400, average speeds typically improved (40-50 mph).

C

Congestion Type: Mainline Congestion

Frequency: Most observations after 7:00 a.m.

Direction: Southbound

Location: Between Old Peachtree Rd and I-285

Queue Length: 8 to 13 miles

Estimated Speed: 30 to 50 mph

Potential Cause(s): During previous aerial surveys, moderate to severe southbound congestion between SR 120 and Indian Trail Rd persisted throughout the morning commute. In 2007, while the extent was similar, a lesser degree of congestion was found in terms of severity and duration. (Less congestion was found on I-85 despite major construction projects between the SR 316 and Pleasant Hill Rd interchanges.)

D

Congestion Type: Entrance Ramp Queue

Location: SR 120 (Duluth Hwy)

Frequency: Most observations

Direction: Southbound

Note: Vehicles at the head of the one-lane ramp merged into the mainline on I-85 at the SR 316 Interchange construction zone (no shoulder at merge); in most cases, congestion on the ramp backed onto the service road and onto the SR 120 ramp.

G

Congestion Type: Exit Ramp Queue

Location: Chamblee Tucker Rd

Frequency: Intermittent

Direction: Southbound

Queue Population: 20 to 30 vpl

Number of Lanes: One

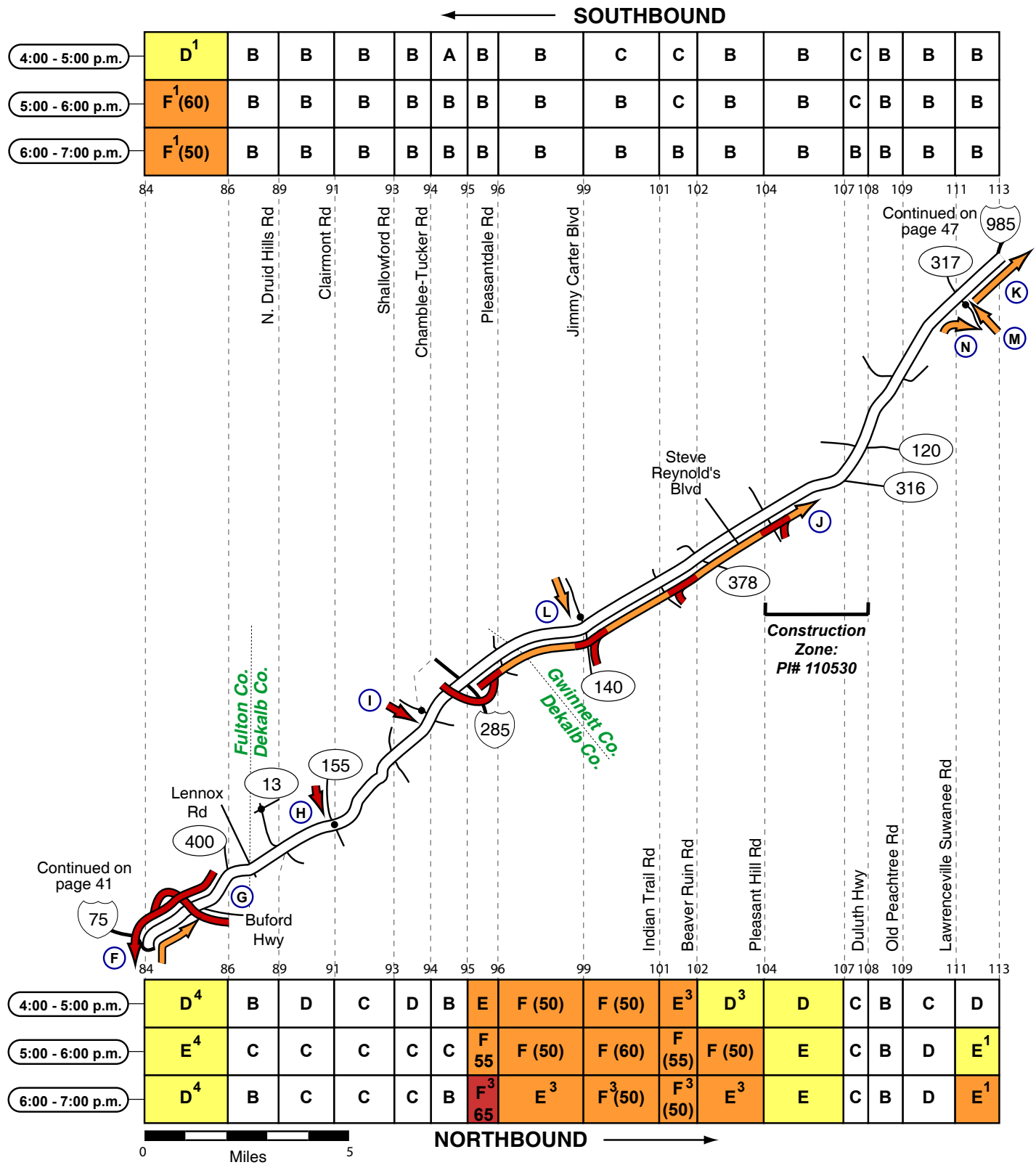
Note: When congested, vehicles were queued in the right lane; vehicles at the head of the ramp waited to merge into northbound flow on Chamblee-Tucker Rd.

Construction Zone

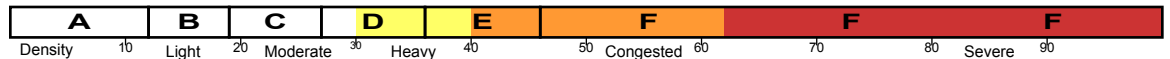
PI# 110530

Description: Interchange construction at SR 316

I-85 (Fulton/Dekalb & Gwinnett Counties) - Evening



Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

I-85 (Fulton/Dekalb & Gwinnett Counties) - Evening

F

Congestion Type: Mainline Congestion
Frequency: Most observations after 5:00 p.m.
Direction: Southbound
Location: Between SR 400 and I-75/I-85
Queue Length: 2 to 3 miles
Estimated Speed: 20 to 40 mph
Potential Cause(s): The head of the queue was found downstream on I-75/I-85.

G

Congestion Type: Mainline Congestion
Frequency: Most observations
Direction: Northbound
Location: Between the I-75/I-85 split and SR 400
Queue Length: 1 to 2 miles
Estimated Speed: 40 to 50 mph
Potential Cause(s): The merging associated with traffic exiting at SR 13 (Buford Highway).

H

Congestion Type: Congested Cross Road
Location: SR 155
Frequency: Peak Hour
Direction: Southbound
Queue Population: 30 to 50 vpl
Number of Lanes: Two Thru-Lanes

I

Congestion Type: Congested Cross Road
Location: Chamblee-Tucker Rd
Frequency: Peak Hour
Direction: Eastbound
Queue Population: 30 to 50 vpl
Number of Lanes: Two

J

Congestion Type: Mainline Congestion
Frequency: Most observations
Direction: Northbound
Location: Between the Perimeter and SR 316
Queue Length: 9 to 10 miles
Estimated Speed: 20 to 50 mph
Potential Cause(s): Traffic entering at the interchanges along this corridor

K

Congestion Type: Mainline Congestion
Frequency: Intermittently after 5:00 p.m.
Direction: Northbound
Location: Between SR 317 and I-985
Queue Length: 1 to 2 miles
Estimated Speed: 30 to 50 mph
Potential Cause(s): The primary bottleneck was found at the lane drop (3 lanes to 2) at I-985; while congestion persisted north of the lane drop, traffic flow typically improved.
Note: Ongoing construction between I-985 and SR 20 may have exacerbated the congestion.

L

Congestion Type: Congested Cross Road
Location: SR 140 (Jimmy Carter Blvd)
Frequency: Intermittent
Direction: Southbound
Queue Population: 20 to 30 vpl
Number of Lanes: Two Thru-Lanes

M

Congestion Type: Congested Cross Road
Location: SR 317
Frequency: Peak Hour
Direction: Northbound
Queue Population: 30 to 40 vpl
Number of Lanes: Two Thru-Lanes

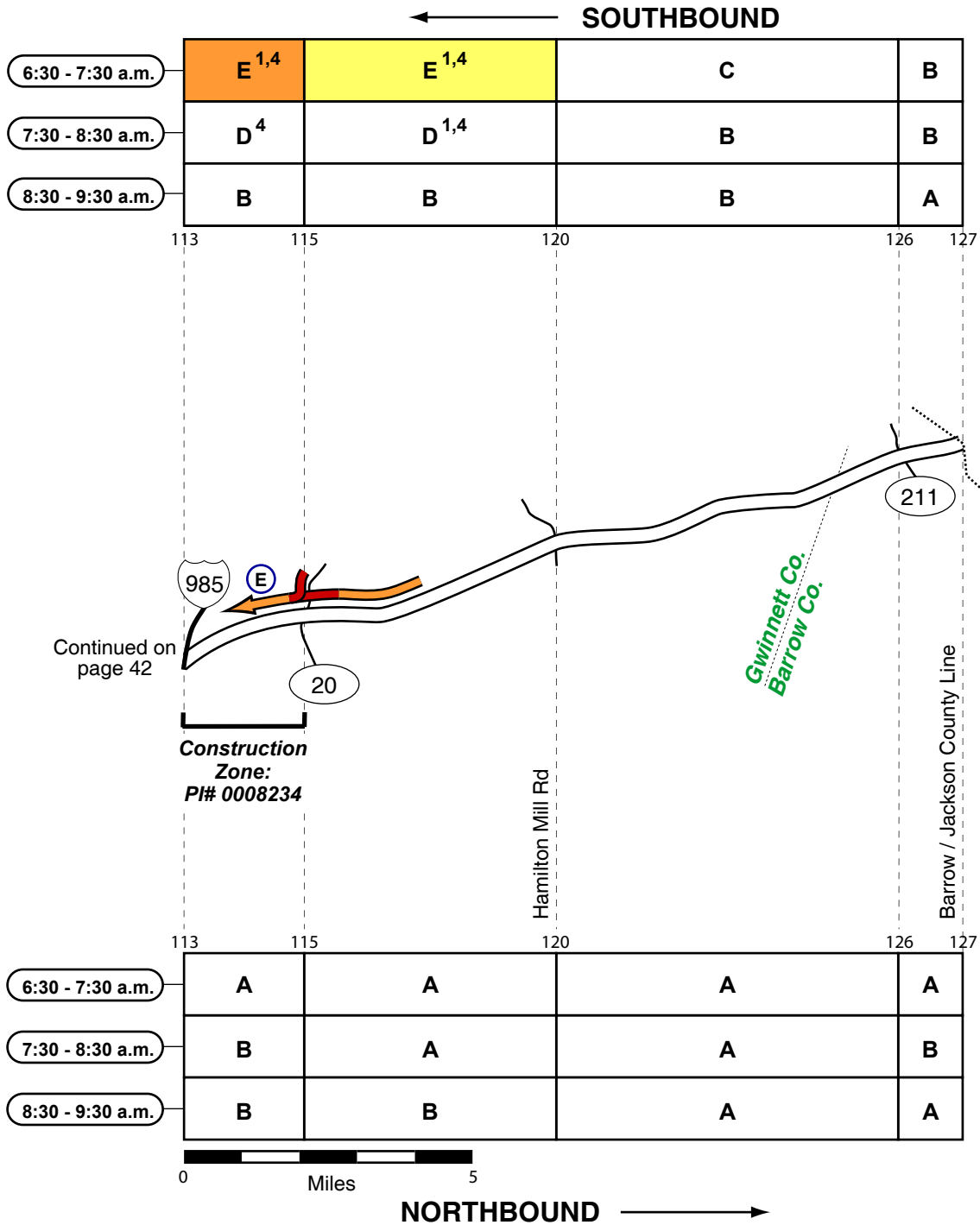
N

Congestion Type: Exit Ramp Queue
Location: SR 317
Frequency: Intermittent
Direction: Northbound
Queue Population: 20 to 30 vpl
Number of Lanes: Two Left-Turn Lanes

Construction Zone

PI# 110530

Description: Interchange construction at SR 316

I-85 (Gwinnett & Barrow Counties) - Morning

E

Congestion Type: Mainline Congestion

Frequency: Most observations before 8:00 a.m.

Direction: Southbound

Location: Between Hamilton Mill Rd and SR 20

Queue Length: 1 to 2 miles

Estimated Speed: 30 to 50 mph

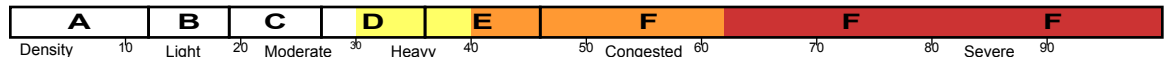
Potential Cause(s): In some cases, stop-and-go congestion was found in the vicinity of the SR 20 Interchange where vehicles merged into the mainline; construction may have exacerbated the construction.

Construction Zone

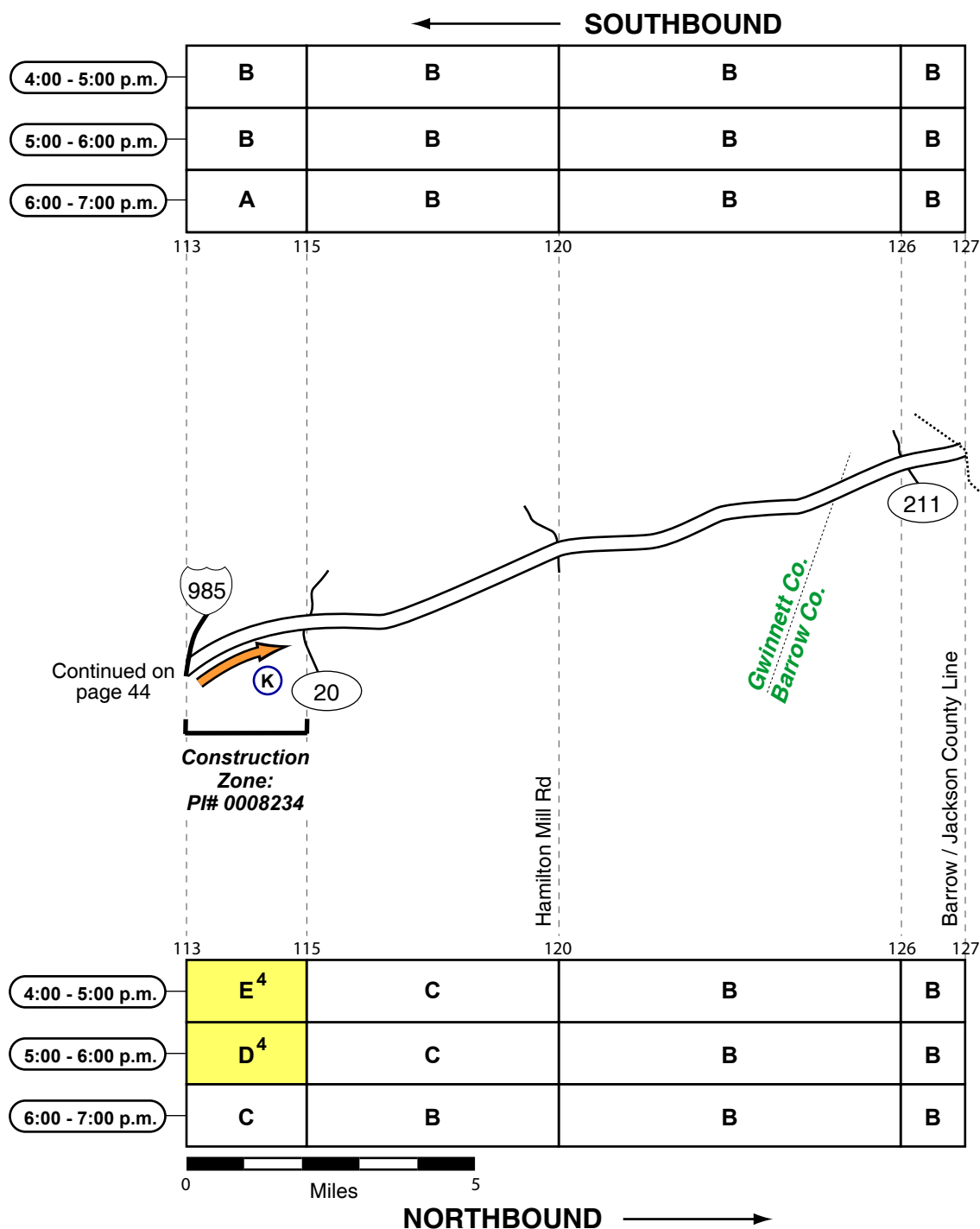
PI# 0008234

Description: Construction of auxiliary lanes between SR 20 and I-985

Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

I-85 (Gwinnett & Barrow Counties) - Evening



K

Congestion Type: Mainline Congestion

Frequency: Intermittently after 5:00 p.m.

Direction: Northbound

Location: Between SR 317 and I-985

Queue Length: 1 to 2 miles

Estimated Speed: 30 to 50 mph

Potential Cause(s): The primary bottleneck was the lane drop (3 lanes to 2) at I-985; while congestion persisted north of the lane drop, traffic flow typically improved.

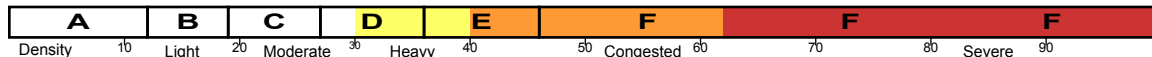
Note: Ongoing construction between I-985 and SR 20 may have exacerbated the congestion.

Construction Zone

PI# 0008234

Description: Construction of auxiliary lanes between I-985 and SR 20

Traffic Quality Rating

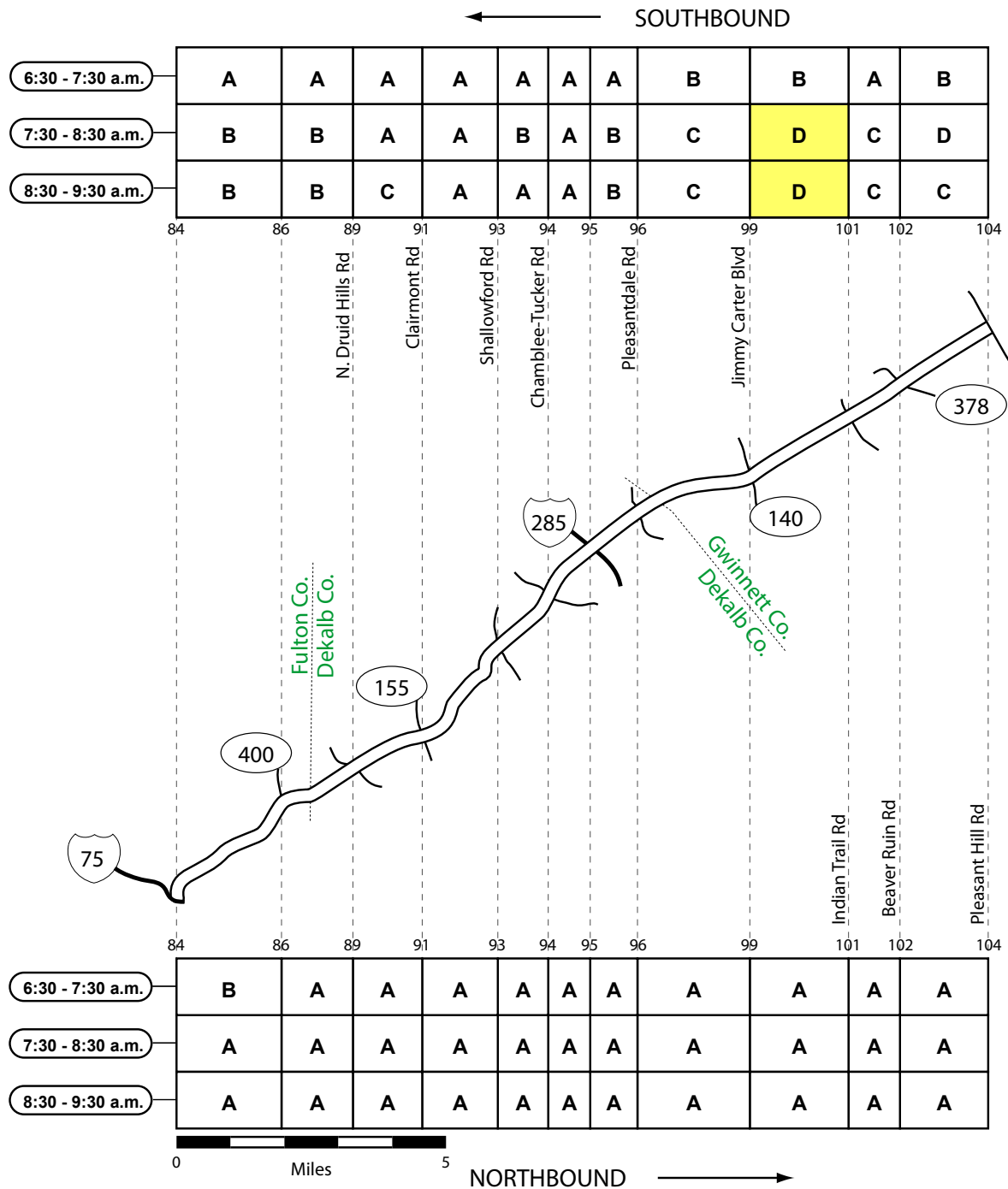


Superscripts: ¹ Type 1 nested congestion (some days, not others).

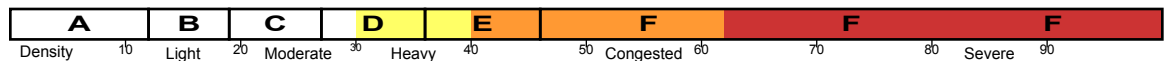
² Type 2 nested congestion (more severe in left or right-hand lanes).

³ Type 3 nested congestion (present only in the first or second half-hour period).

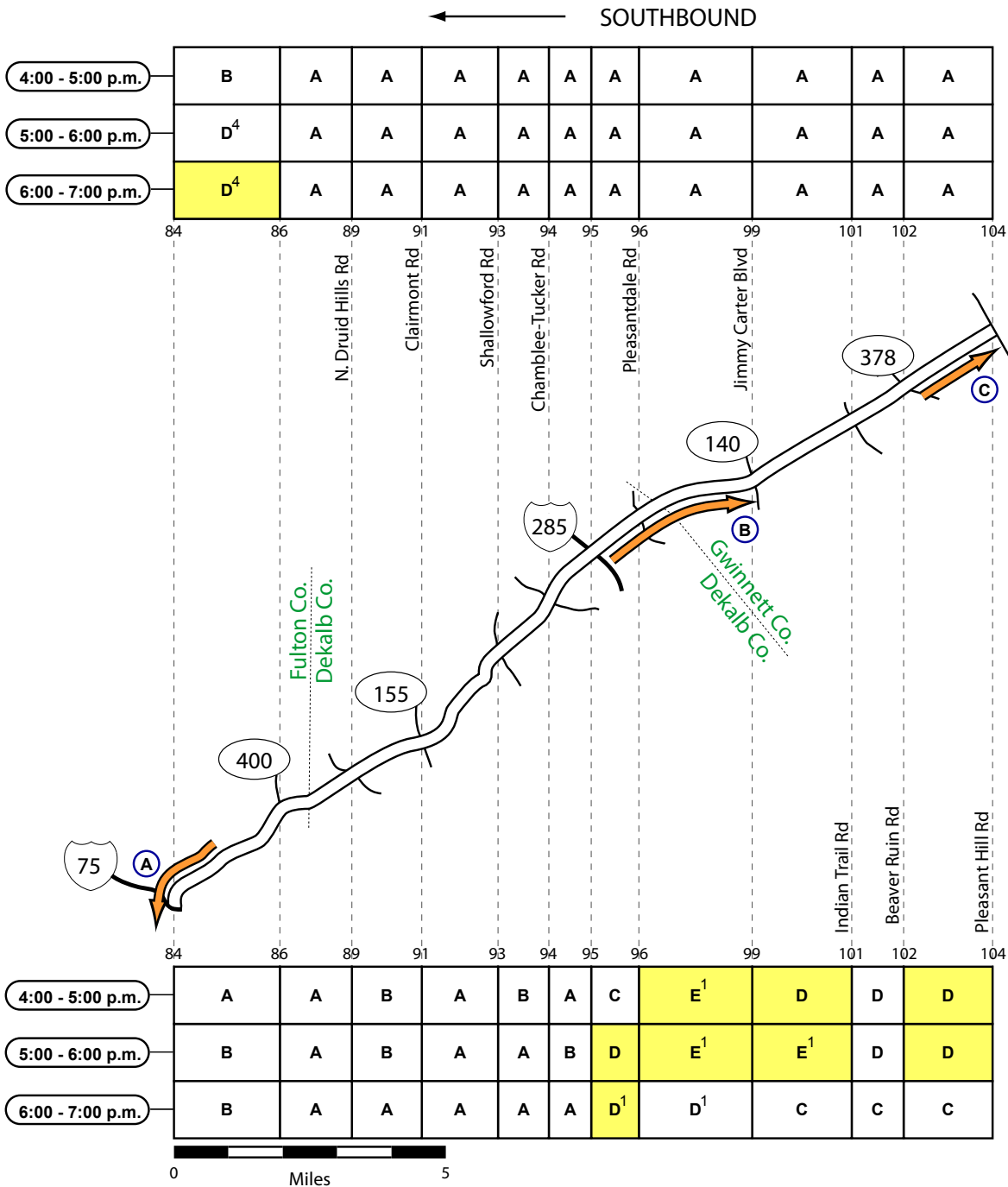
⁴ Type 4 nested congestion (partial length of segment).

I-85 HOV (Fulton/Dekalb & Gwinnett Counties) -Morning

Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

I-85 HOV (Fulton/Dekalb & Gwinnett Counties) - Evening

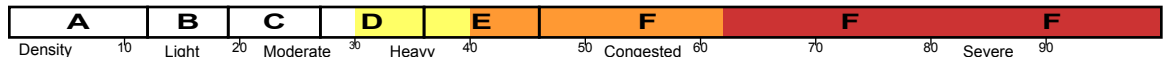


A
 Congestion Type: Mainline Congestion
 Frequency: Most observations between 5:00 and 6:30 p.m.
 Direction: Southbound
 Location: Between SR 400 and I-75/I-85
 Queue Length: 1 to 2 miles
 Estimated Speed: 25 to 45 mph
 Potential Cause(s): Friction between the congested "general-purpose" lanes and the HOV facility

B
 Congestion Type: Mainline Congestion
 Frequency: Intermittently between 4:30 and 6:30 p.m.
 Direction: Northbound
 Location: Between I-285 and SR 140
 Queue Length: 3 to 4 miles
 Estimated Speed: 40 to 50 mph
 Potential Cause(s): Friction between the congested "general-purpose" lanes and the HOV facility

C
 Congestion Type: Mainline Congestion
 Frequency: Intermittently between 4:30 and 5:30 p.m.
 Direction: Northbound
 Location: Between SR 378 and Pleasant Hill Rd
 Queue Length: 1 to 2 miles
 Estimated Speed: 40 to 50 mph
 Potential Cause(s): The merge into the congested "general-purpose" lanes at the HOV terminus

Traffic Quality Rating



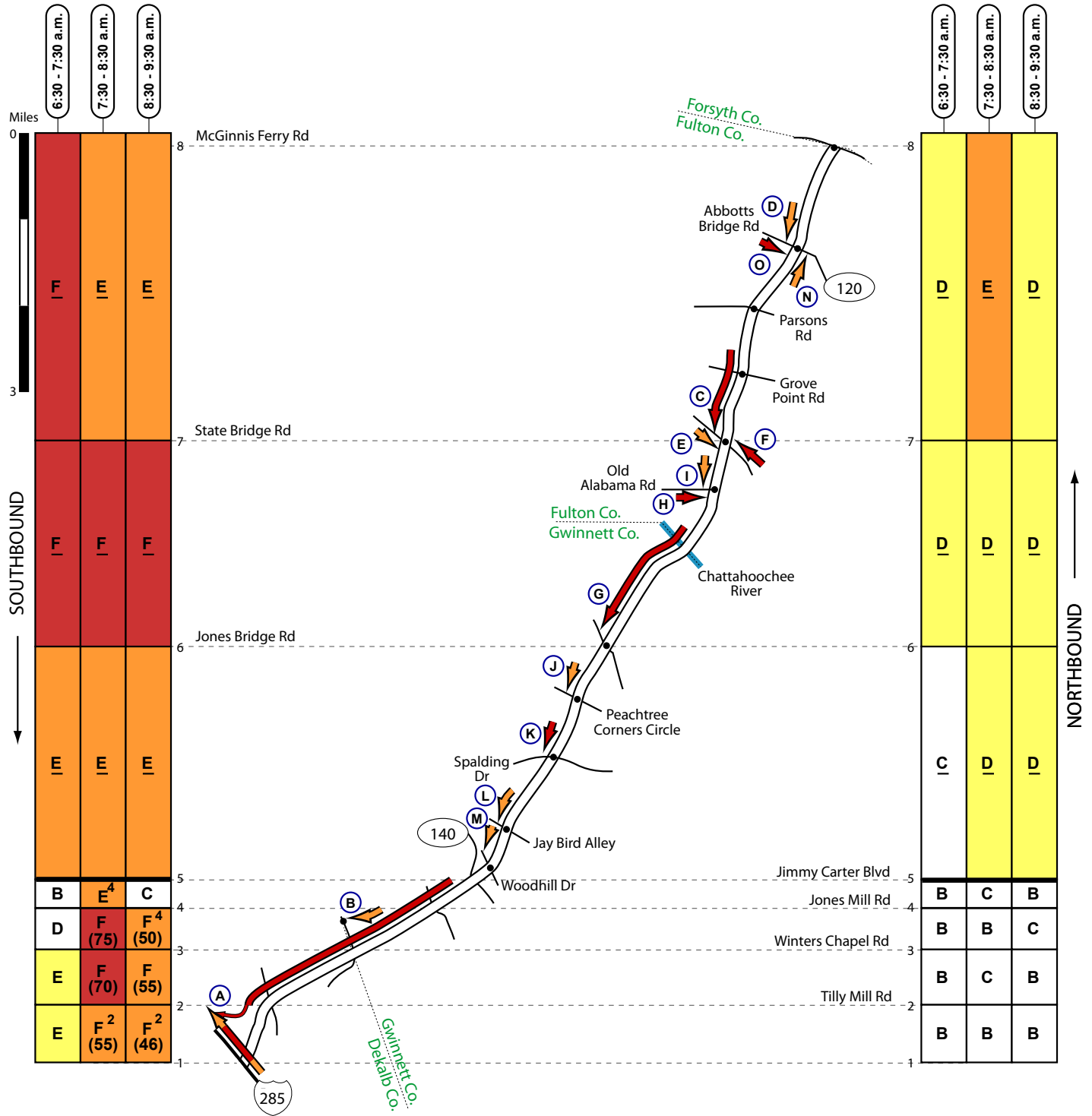
Superscripts: ¹ Type 1 nested congestion (some days, not others).

² Type 2 nested congestion (more severe in left or right-hand lanes).

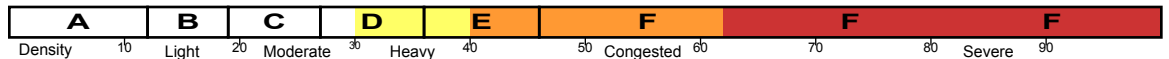
³ Type 3 nested congestion (present only in the first or second half-hour period).

⁴ Type 4 nested congestion (partial length of segment).

SR 141 (Fulton/Gwinnett & Dekalb Counties) - Morning



Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

SR 141 (Fulton/Gwinnett & Dekalb Counties) - Morning

A

Congestion Type: Mainline Congestion
 Frequency: Most observations
 Direction: Southbound
 Location: Between Jimmy Carter Blvd and I-285
 Queue Length: 2 to 3 miles
 Estimated Speed: 20 to 40 mph
 Potential Cause(s): The head of the queue was found on the ramp to I-285; congestion typically extended back into the right lane (and eventually across all lanes) of SR 141.

B

Congestion Type: Exit Ramp Queue
 Location: Winters Chapel Rd
 Frequency: Intermittent
 Direction: Southbound
 Queue Population: 20 to 30 vpl
 Number of Lanes: Three

C

Congestion Type: Signal Queue
 Location: State Bridge Rd
 Frequency: Most observations
 Direction: Southbound
 Queue Populations: 20 to 80 vpl
 Number of Lanes: 2
 Note: During some observations, southbound congestion approaching the signal at State Bridge Rd extended back through several upstream signals (Grove Point Rd and Medlock Bridge Pkwy).

D

Congestion Type: Signal Queue
 Location: SR 120
 Frequency: Intermittent
 Direction: Southbound
 Queue Populations: 20 to 30 vpl
 Number of Lanes: 2

E

Congestion Type: Congested Cross Road
 Location: State Bridge Rd
 Frequency: Intermittent
 Direction: Eastbound
 Queue Populations: 20 to 40 vpl
 Number of Lanes: 2

F

Congestion Type: Congested Cross Road
 Location: State Bridge Rd
 Frequency: Most observations
 Direction: Westbound
 Queue Populations: 20 to 60 vpl
 Number of Lanes: 2

G

Congestion Type: Signal Queue
 Location: Jones Bridge Rd
 Frequency: Most observations
 Direction: Southbound
 Queue Populations: 20 to 175 vpl
 Number of Lanes: 2
 Note: During the peak period, southbound congestion approaching the signal at Jones Bridge Rd typically extended back across the Chattahoochee River to the vicinity of Old Alabama Rd (a distance of approximately two miles).

H

Congestion Type: Congested Cross Road
 Location: Old Alabama Rd
 Frequency: Most observations
 Direction: Eastbound
 Queue Populations: 20 to 40 vpl
 Number of Lanes: 1
 Note: When congested, vehicles were queued in the left lane of two waiting at the signal to turn northbound onto SR 141.

I

Congestion Type: Signal Queue
 Location: Old Alabama Rd
 Frequency: Intermittent
 Direction: Southbound
 Queue Populations: 20 to 30 vpl
 Number of Lanes: 2

J

Congestion Type: Signal Queue
 Location: Peachtree Corners Circle
 Frequency: Intermittent
 Direction: Southbound
 Queue Populations: 20 to 30 vpl
 Number of Lanes: 2

K

Congestion Type: Signal Queue
 Location: Spalding Dr
 Frequency: Most observations
 Direction: Southbound
 Queue Populations: 20 to 45 vpl
 Number of Lanes: 2

L

Congestion Type: Signal Queue
 Location: Jay Bird Alley
 Frequency: Intermittent
 Direction: Southbound
 Queue Populations: 20 to 30 vpl
 Number of Lanes: 2

M

Congestion Type: Signal Queue
 Location: Woodhill Dr
 Frequency: Intermittent
 Direction: Southbound
 Queue Populations: 20 to 30 vpl
 Number of Lanes: 2

N

Congestion Type: Signal Queue
 Location: SR 120
 Frequency: Intermittent
 Direction: Northbound
 Queue Populations: 20 to 30 vpl
 Number of Lanes: 2

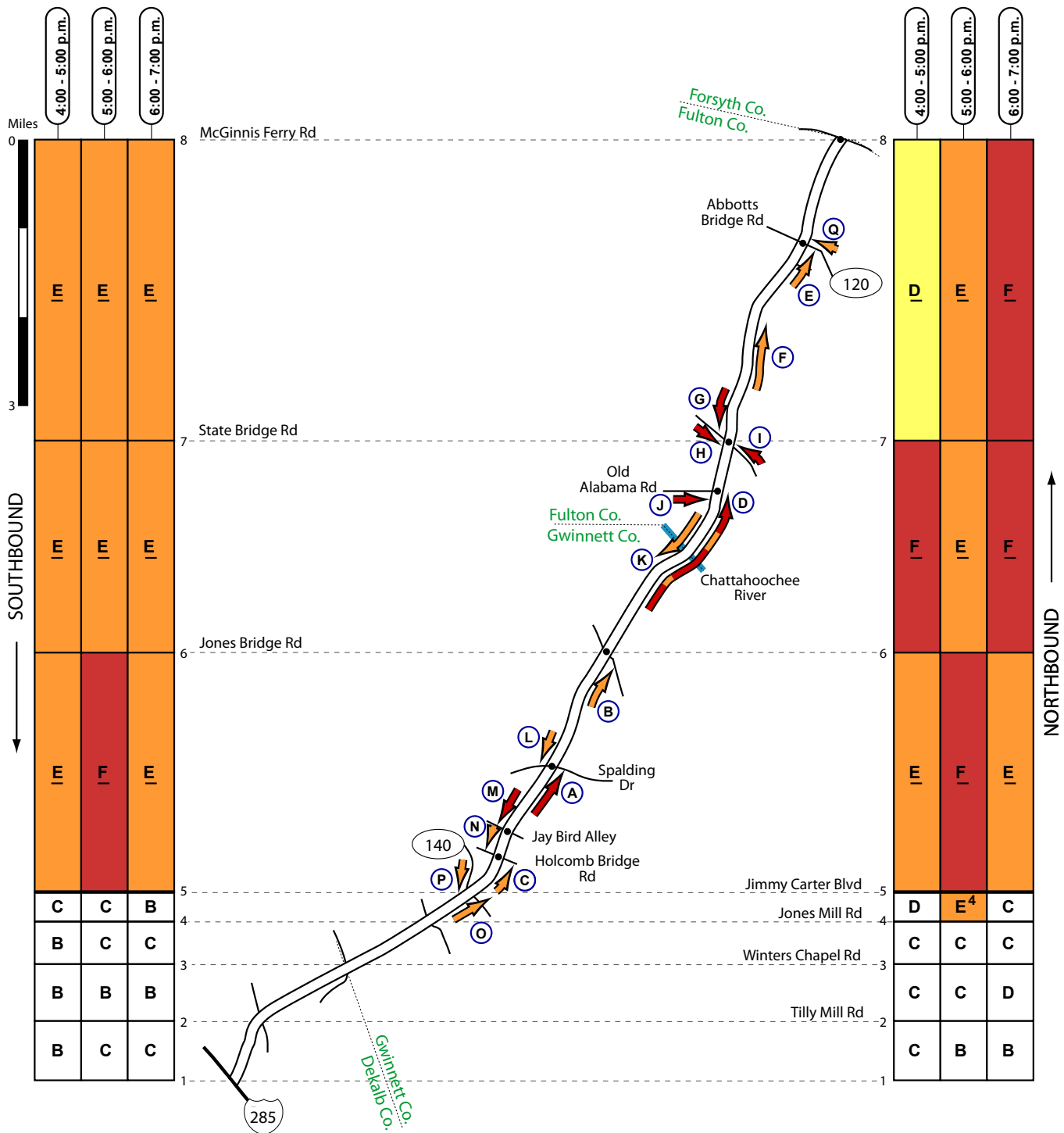
O

Congestion Type: Congested Cross Rd
 Location: SR 120
 Frequency: Most observations
 Direction: Eastbound
 Queue Populations: 35 to 45 vpl
 Number of Lanes: 1

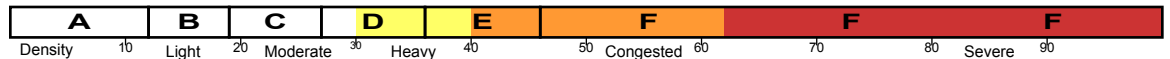
Traffic Quality Rating

| <u>A</u> | <u>B</u> | <u>C</u> | <u>D</u> | <u>E</u> | <u>F</u> |
|------------|----------|----------|----------|-----------|----------|
| Very Light | Light | Moderate | Heavy | Congested | Severe |

SR 141 (Fulton/Gwinnett & DeKalb Counties) - Evening



Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

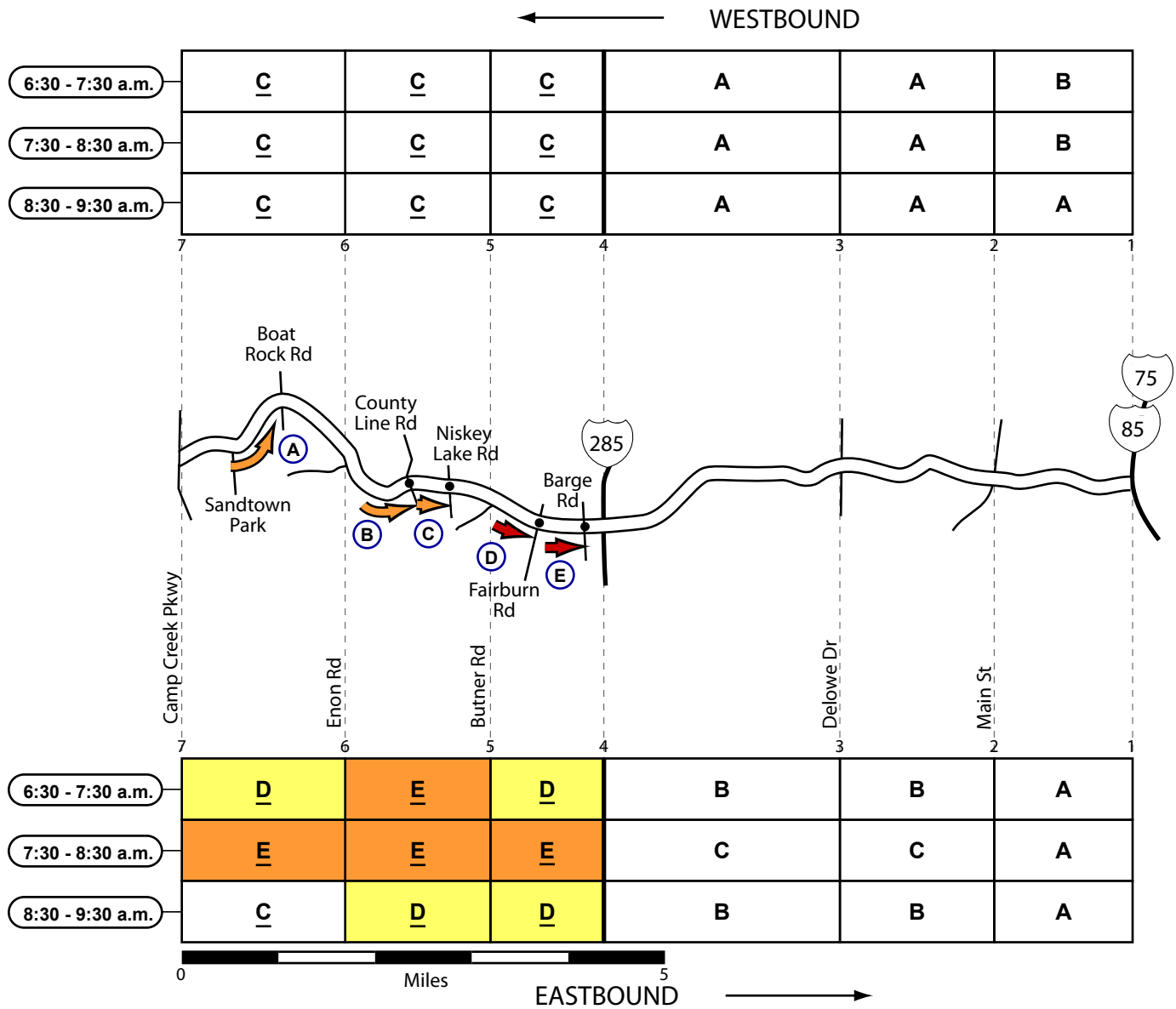
SR 141 (Fulton/Gwinnett & Dekalb Counties) - Evening

| | | |
|--|---|---|
| <p>A Congestion Type: Signal Queue Location: Spalding Dr Frequency: Most observations Direction: Northbound Queue Populations: 30 to 65 vpl Number of Lanes: 2</p> | <p>H Congestion Type: Congested Cross Road Location: State Bridge Rd Frequency: Most observations Direction: Eastbound Queue Populations: 20 to 60 vpl Number of Lanes: 2</p> | <p>O Congestion Type: Mainline Congestion Frequency: On some days but not others Direction: Northbound Location: Between Jones Mill Rd and Holcomb Bridge Rd Queue Length: .5 to 1 miles Potential Cause(s): The signal at the freeway terminus at Holcomb Bridge Rd</p> |
| <p>B Congestion Type: Signal Queue Location: Jones Bridge Rd Frequency: Intermittent Direction: Northbound Queue Populations: 20 to 35 vpl Number of Lanes: 2</p> | <p>I Congestion Type: Congested Cross Road Location: State Bridge Rd Frequency: Most observations Direction: Westbound Queue Populations: 20 to 40 vpl Number of Lanes: 2</p> | <p>P Congestion Type: Congested Cross Road Location: SR 140 Frequency: Intermittent Direction: Southbound Queue Population: 20 to 25 vpl Number of Lanes: 2</p> |
| <p>C Congestion Type: Signal Queue Location: Holcomb Bridge Rd Frequency: Intermittent Direction: Northbound Queue Populations: 20 to 30 vpl Number of Lanes: 2</p> | <p>J Congestion Type: Congested Cross Road Location: Old Alabama Rd Frequency: Most observations Direction: Eastbound Queue Populations: 20 to 60 vpl Number of Lanes: 1 Note: When congested, vehicles were queued in the left lane waiting to turn northbound onto SR 141.</p> | <p>Q Congestion Type: Congested Cross Road Location: SR 120 Frequency: Intermittent Direction: Westbound Queue Population: 20 to 25 vpl Number of Lanes: 1</p> |
| <p>D Congestion Type: Signal Queue Location: Old Alabama Rd Frequency: Most observations Direction: Northbound Queue Populations: 40 to 150 vpl Number of Lanes: 2 Note: During the peak period, congestion typically extended back across the Chattahoochee River; on two of the mornings surveyed, congestion extended all the way back to Jones Bridge Rd (a distance of approximately 2 miles).</p> | <p>K Congestion Type: Platoons Location: Between State Bridge Rd & Jones Bridge Rd Frequency: Most observations Direction: Southbound Platoon Populations: 25 to 35 vpl Number of Lanes: 2</p> | |
| <p>E Congestion Type: Signal Queue Location: SR 120 (Abbotts Bridge Rd) Frequency: Intermittent Direction: Northbound Queue Populations: 40 to 45 vpl Number of Lanes: 2</p> | <p>L Congestion Type: Signal Queue Location: Spalding Dr Frequency: Intermittent Direction: Southbound Queue Populations: 20 to 25 vpl Number of Lanes: 2</p> | |
| <p>F Congestion Type: Platoons Location: Between State Bridge Rd & SR 120 Frequency: Intermittent Direction: Northbound Platoon Populations: 25 to 35 vpl Number of Lanes: 2</p> | <p>M Congestion Type: Signal Queue Location: Jay Bird Alley Frequency: Most observations Direction: Southbound Queue Populations: 30 to 45 vpl Number of Lanes: 2</p> | |
| <p>G Congestion Type: Signal Queue Location: State Bridge Rd Frequency: Intermittent Direction: Southbound Queue Populations: 20 to 65 vpl Number of Lanes: 2 Note: During some observations, congestion in the left-turn bay extended back into the left lane on SR 141.</p> | <p>N Congestion Type: Signal Queue Location: Holcomb Bridge Rd Frequency: Intermittent Direction: Southbound Queue Populations: 20 to 30 vpl Number of Lanes: 2</p> | |

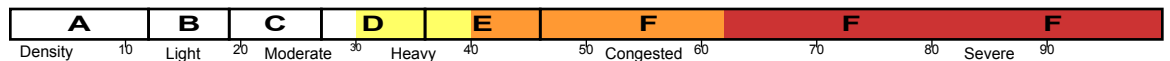
Traffic Quality Rating

| | | | | | |
|------------|----------|----------|----------|-----------|----------|
| A | B | C | D | E | F |
| Very Light | Light | Moderate | Heavy | Congested | Severe |

SR 166 (Fulton County) - Morning



Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

SR 166 (Fulton County) - Morning

A

Congestion Type: Platoons

Location: Between Camp Creek Pkwy & Enon Rd

Frequency: Intermittent

Direction: Eastbound

Platoon Populations: 25 to 35 vpl

Number of Lanes: 1

Note: Vehicles waiting to turn left at Boat Rock Rd (no signal - waiting for gap in westbound traffic) may have contributed to the formation of the platoons.

B

Congestion Type: Signal Queue

Location: County Line Rd

Frequency: Intermittent

Direction: Eastbound

Queue Populations: 20 to 40 vpl

Number of Lanes: 1

C

Congestion Type: Signal Queue

Location: Niskey Lake Rd

Frequency: Intermittent

Direction: Eastbound

Queue Populations: 20 to 35 vpl

Number of Lanes: 1

D

Congestion Type: Signal Queue

Location: Fairburn Rd

Frequency: Peak Hour

Direction: Eastbound

Queue Populations: 20 to 25 vpl

Number of Lanes: 2

E

Congestion Type: Signal Queue

Location: Barge Rd

Frequency: Peak Hour

Direction: Eastbound

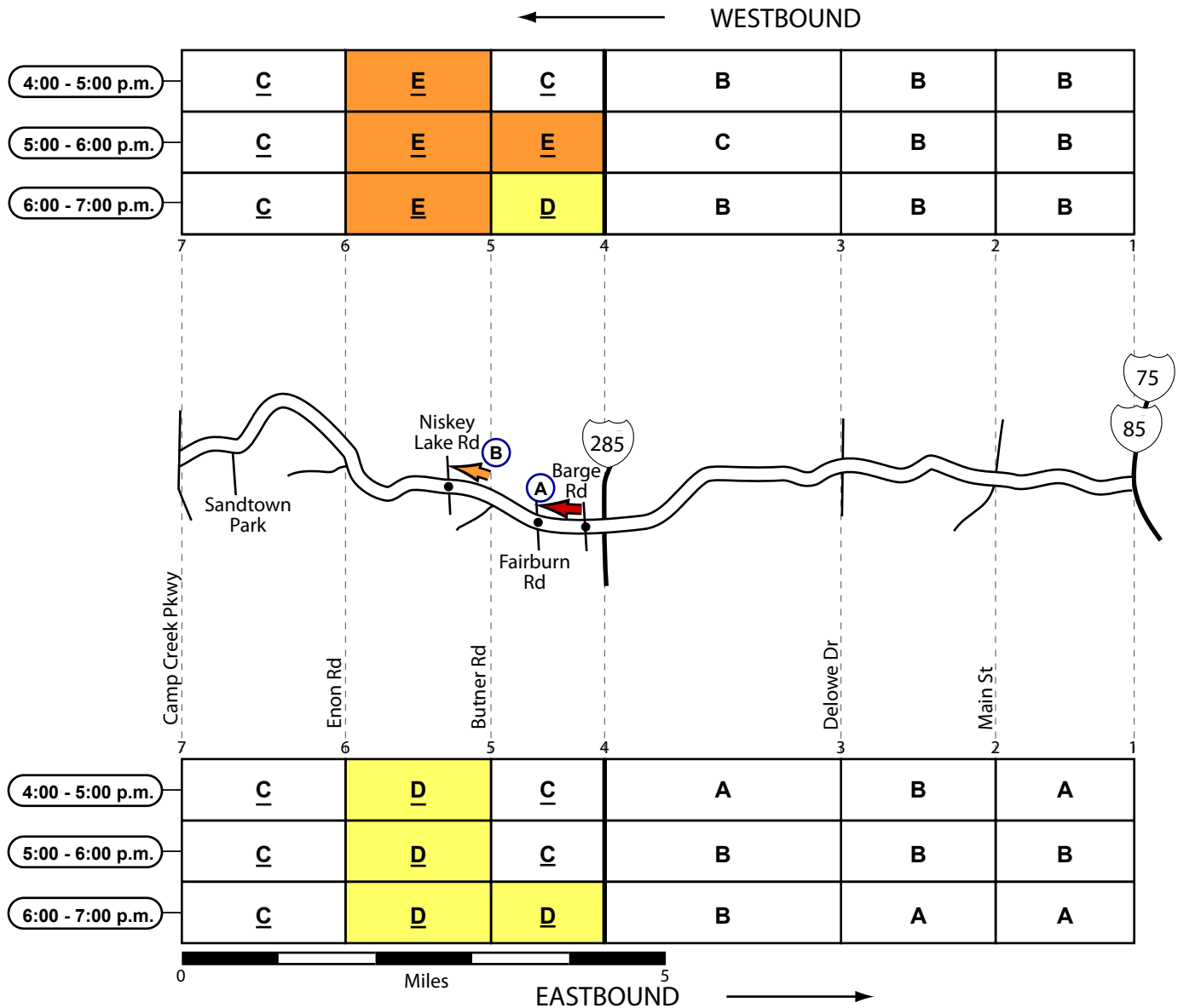
Queue Populations: 20 to 30 vpl

Number of Lanes: 2

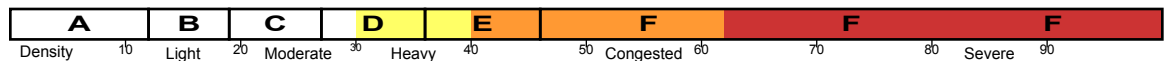
Traffic Quality Rating

| <u>A</u> | <u>B</u> | <u>C</u> | <u>D</u> | <u>E</u> | <u>F</u> |
|------------|----------|----------|----------|-----------|----------|
| Very Light | Light | Moderate | Heavy | Congested | Severe |

SR 166 (Fulton County) - Evening



Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

SR 166 (Fulton County) - Evening

A

Congestion Type: Signal Queue

Location: Fairburn Rd

Frequency: Peak Hour

Direction: Westbound

Queue Populations: 20 to 30 vpl

Number of Lanes: 2

Note: During one observation, eastbound congestion approaching Fairburn Rd extended back through the upstream signal at Barge Rd.

B

Congestion Type: Signal Queue

Location: Niskey Lake Rd

Frequency: Intermittent

Direction: Westbound

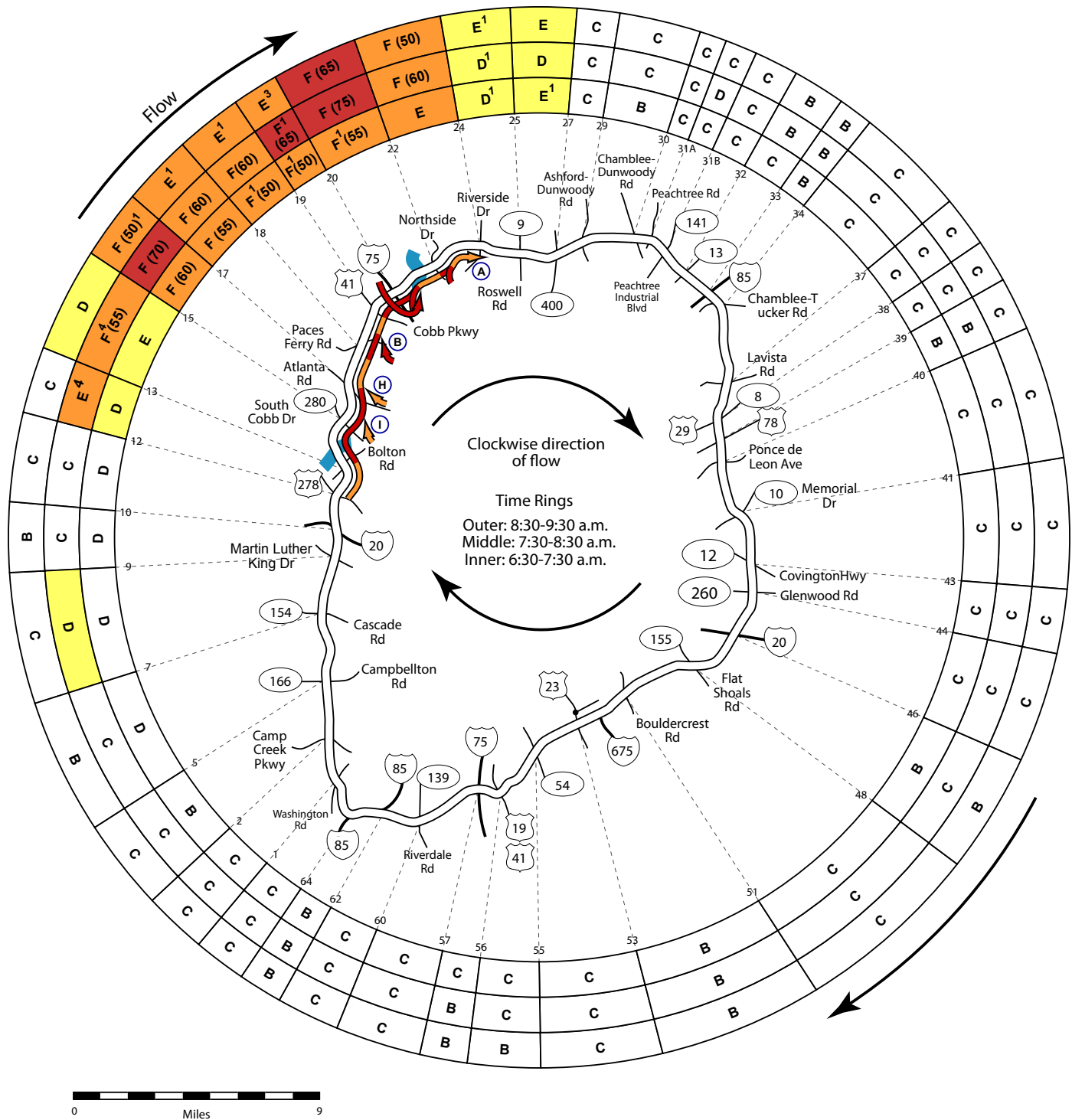
Queue Populations: 20 to 30 vpl

Number of Lanes: 1

Traffic Quality Rating

| <u>A</u> | <u>B</u> | <u>C</u> | <u>D</u> | <u>E</u> | <u>F</u> |
|------------|----------|----------|----------|-----------|----------|
| Very Light | Light | Moderate | Heavy | Congested | Severe |

The Perimeter (I-285 Clockwise) - Morning



The Perimeter (I-285 Clockwise) - Morning

A

Congestion Type: Mainline Congestion

Frequency: Most observations

Direction: Northeast-bound

Location: Between I-20 and SR 9 (Roswell Rd)

Queue Length: 9 to 12 miles

Estimated Speed: 15 to 50 mph

Potential Cause(s): The primary cause of congestion appeared to be traffic entering the mainline at the interchanges along this section of I-285; the primary bottleneck was found at the closely spaced ramps where traffic entered I-285 from I-75 and the service road originating at SR 3 (Cobb Pkwy).

B

Congestion Type: Entrance Ramp Queue

Location: Paces Ferry Rd

Frequency: Most observations

Direction: Northbound

Queue Population: 20 to 40 vpl

Number of Lanes: One/Two

Note: The head of the ramp queue was found where vehicles merged into the mainline on I-285; the lane drop (2 lanes to 1) on the entrance ramp appeared to exacerbate the congestion.

H

Congestion Type: Entrance Ramp Queue

Location: Atlanta Rd

Frequency: Intermittent

Direction: Northbound

Queue Population: 20 to 30 vpl

Number of Lanes: One

Note: The head of the queue was found where vehicles merged into northbound flow on I-285.

I

Congestion Type: Entrance Ramp Queue

Location: SR 280 (S. Cobb Dr)

Frequency: Intermittent

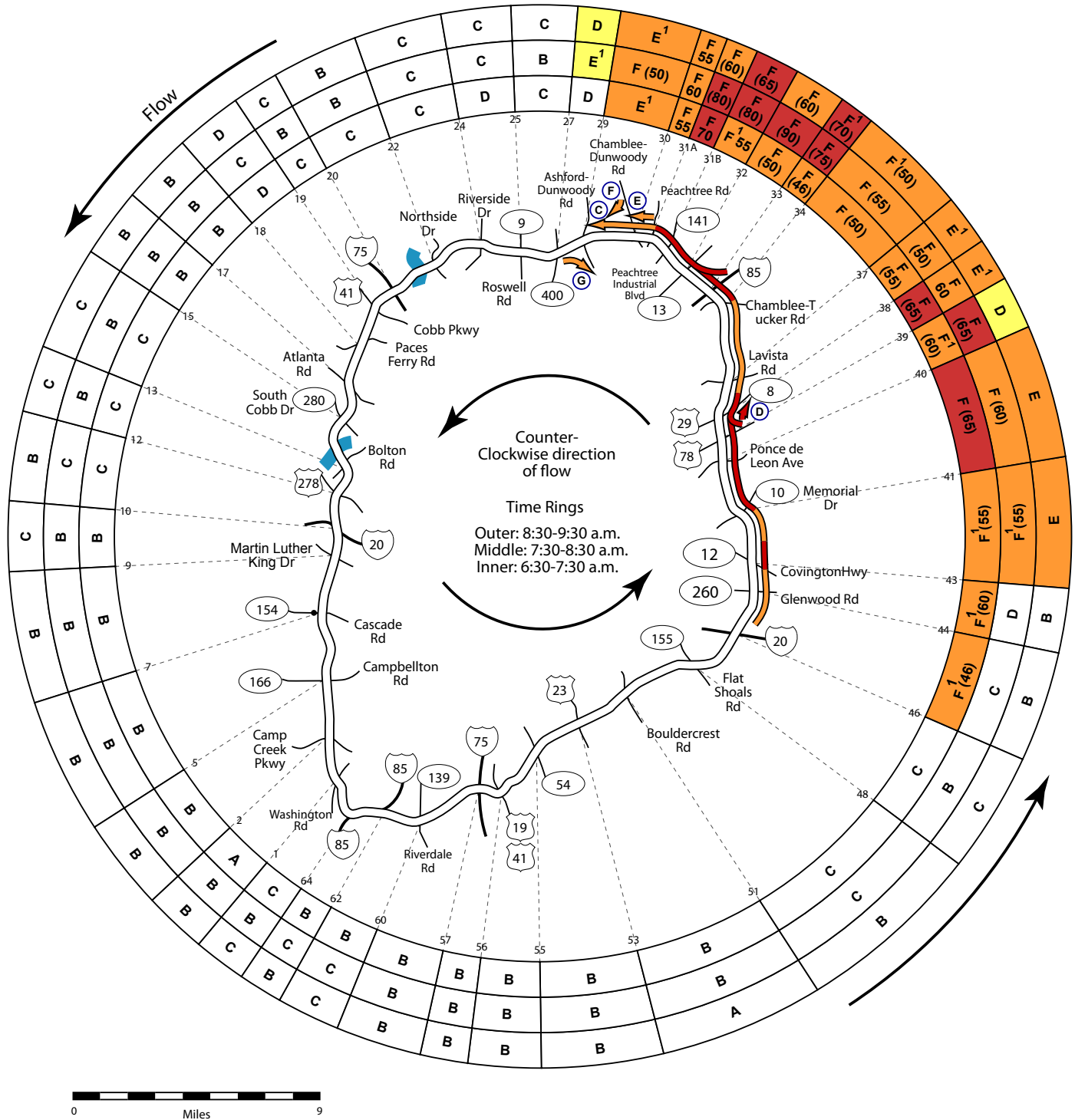
Direction: Northbound

Queue Population: 20 to 40 vpl

Number of Lanes: One

Note: The head of the queue was found where vehicles merged into northbound flow on I-285.

The Perimeter (I-285 Counter-Clockwise) - Morning



The Perimeter (I-285 Counter-Clockwise) - Morning

C

Congestion Type: Mainline Congestion

Frequency: Most observations

Direction: Northwest-bound

Location: Between I-20 and Ashford-Dunwoody Rd

Queue Length: 12 to 15 miles

Estimated Speed: 15 to 50 mph

Potential Cause(s): Congestion appeared to be exacerbated by merging and weaving at the interchanges along this section of I-285, particularly at US 78 and I-85.

D

Congestion Type: Exit Ramp Queue

Location: SR 8

Frequency: Most observations

Direction: Northbound

Queue Population: 20 to 50 vpl

Number of Lanes: One

Note: Construction at the I-285/SR 8 Interchange appeared to cause the congestion.

E

Congestion Type: Frontage Road Queue

Location: Chamblee-Dunwoody Rd

Frequency: Intermittent

Direction: Westbound

Queue Population: 20 to 50 vpl

Number of Lanes: One

Note: When congested, vehicles were queued in the one thru-lane at the signal (to the westbound I-285 entrance ramp).

F

Congestion Type: Entrance Ramp Queue

Location: Chamblee-Dunwoody Rd

Frequency: Intermittent

Direction: Westbound

Queue Population: 20 to 30 vpl

Number of Lanes: One

Note: The head of the queue was found where vehicles merged into westbound flow on I-285.

G

Congestion Type: Exit Ramp Queue

Location: Ashford-Dunwoody Rd

Frequency: Intermittent

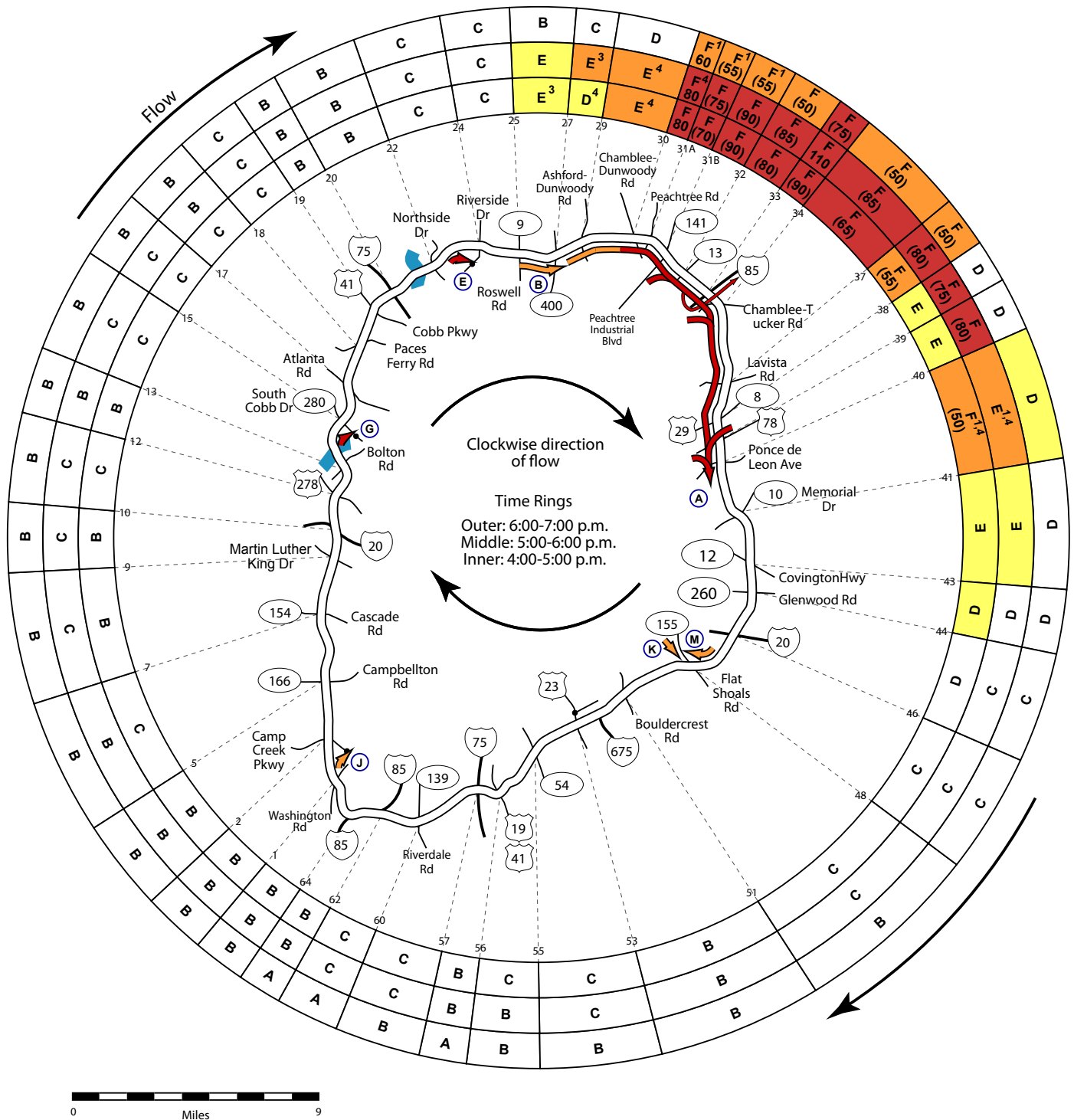
Direction: Eastbound

Queue Population: 20 to 30 vpl

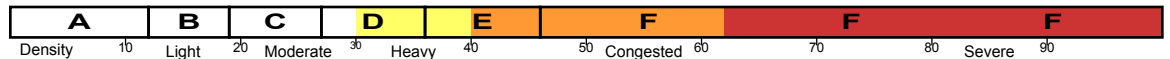
Number of Lanes: One

Note: When congested, vehicles were queued in the left two lanes at the signal at the head of the ramp.

The Perimeter (I-285 Clockwise) - Evening



Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).² Type 2 nested congestion (more severe in left or right-hand lanes).³ Type 3 nested congestion (present only in the first or second half-hour period).⁴ Type 4 nested congestion (partial length of segment).

The Perimeter (I-285 Clockwise) - Evening

A

Congestion Type: Mainline Congestion

Frequency: Most observations

Direction: South-eastbound

Location: Between SR 400 and SR 10 (Memorial Dr)

Queue Length: 10 to 15 miles

Estimated Speed: 10 to 45 mph

Potential Cause(s): Factors contributing to the congestion were: 1) congestion in the exit lanes at I-85 extending back into the mainline of the Perimeter and; 2) traffic entering at the SR 141, I-85 and US 78 interchanges.

Note: Congestion may have been exacerbated by construction in the vicinity of the SR 8 and SR 10 interchanges.

B

Congestion Type: Mainline Congestion

Frequency: Most observations between 4:30 and 5:30 p.m.

Direction: Eastbound

Location: Between Roswell Rd and SR 400

Queue Length: 0.5 to 1.5 miles

Estimated Speed: 25 to 50 mph

Potential Cause(s): The head of the queue was found on the ramp to SR 400; congestion typically extended back into the right two lanes of the Perimeter (thru-traffic in the left lanes of the Perimeter appeared to bypass the queue with little or no delay).

E

Congestion Type: Exit Ramp Queue

Location: Riverside Dr

Frequency: Peak Hour

Direction: Eastbound

Queue Population: 20 to 40 vpl

Number of Lanes: One Left-Turn Lane

G

Congestion Type: Exit Ramp Queue

Location: SR 280

Frequency: Peak Hour

Direction: Northbound

Queue Population: 20 to 25 vpl

Number of Lanes: Two Left-Turn Lanes

J

Congestion Type: Exit Ramp Queue

Location: Camp Creek Parkway

Frequency: Intermittent

Direction: Northbound

Queue Population: 20 to 25 vpl

Number of Lanes: Two Left-Turn Lanes

K

Congestion Type: Congested Cross Road

Location: SR 155 (Flat Shoals Rd)

Frequency: Intermittent

Direction: Southbound

Queue Population: 20 to 25 vpl

Number of Lanes: Two

M

Congestion Type: Exit Ramp Queue

Location: SR 155 (Flat Shoals Rd)

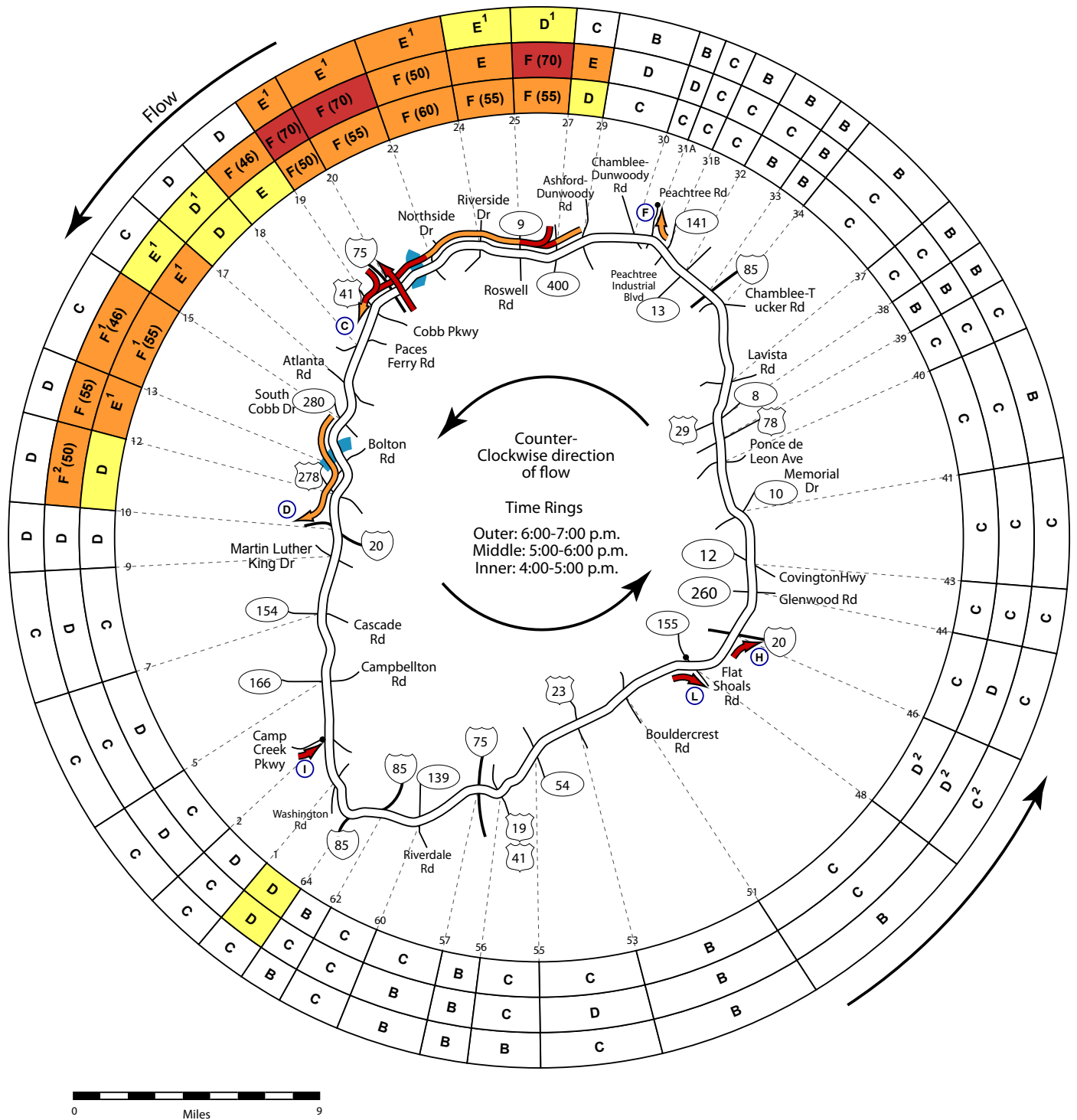
Frequency: Intermittent

Direction: Westbound

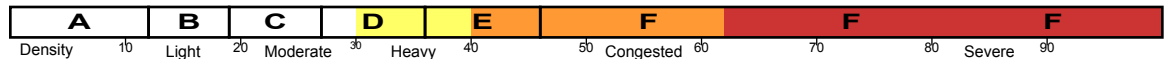
Queue Population: 20 to 30 vpl

Number of Lanes: One Left-Turn Lane

The Perimeter (I-285 Counter-Clockwise) - Evening



Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

The Perimeter (I-285 Counter-Clockwise) - Evening

C

Congestion Type: Mainline Congestion
Frequency: Most observations
Direction: South-westbound
Location: Between Ashford-Dunwoody Rd and Paces Ferry Rd
Queue Length: 6 to 9 miles
Estimated Speed: 20 to 50 mph
Potential Cause(s): Factors contributing to the congestion were: 1) merging associated with the SR 400 and I-75 interchanges and; 2) the series of lane drops (6 lanes to 2) approaching the I-75 interchange.

D

Congestion Type: Mainline Congestion
Frequency: Most observations between 4:30 and 6:00 p.m.
Direction: Southbound
Location: Between SR 280 and I-20
Queue Length: 4 to 5 miles
Estimated Speed: 25 to 50 mph
Potential Cause(s): The head of the queue was found on the ramp to I-20; congestion typically extended back into the right lane (and eventually across all lanes) of the Perimeter.
Note: Factors contributing to the congestion were: 1) the geometrics of the road (sharp bends) along this corridor and; 2) the bridge over the Chattahoochee River.

F

Congestion Type: Exit Ramp Queue
Location: Peachtree Rd
Frequency: Intermittent
Direction: Westbound
Queue Population: 20 to 25 vpl
Number of Lanes: One Thru-Lane

H

Congestion Type: Mainline Congestion
Location: Between Flat Shoals Rd and I-20
Frequency: Most observations
Direction: Northbound
Queue Length: 0.5 to 1 mile
Estimated Speed: 10 to 30 mph
Potential Cause(s): Congestion on the ramp to eastbound I-20 typically extended back into the right lane on I-285; the length of the queue in the right lane varied widely, with the maximum observed queue found in the vicinity of Flat Shoals Rd (a distance of approximately 1.5 miles). The head of the queue on the one lane ramp was found where vehicles merged with ramp traffic from I-285 southbound. During one observation, congestion in the right lane ultimately extended back across all four lanes on I-285.

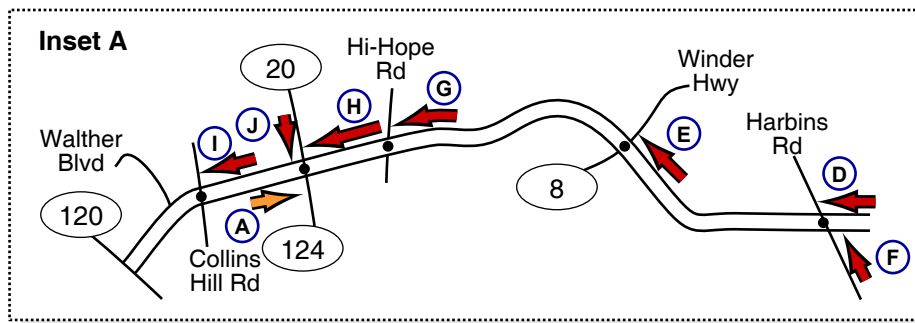
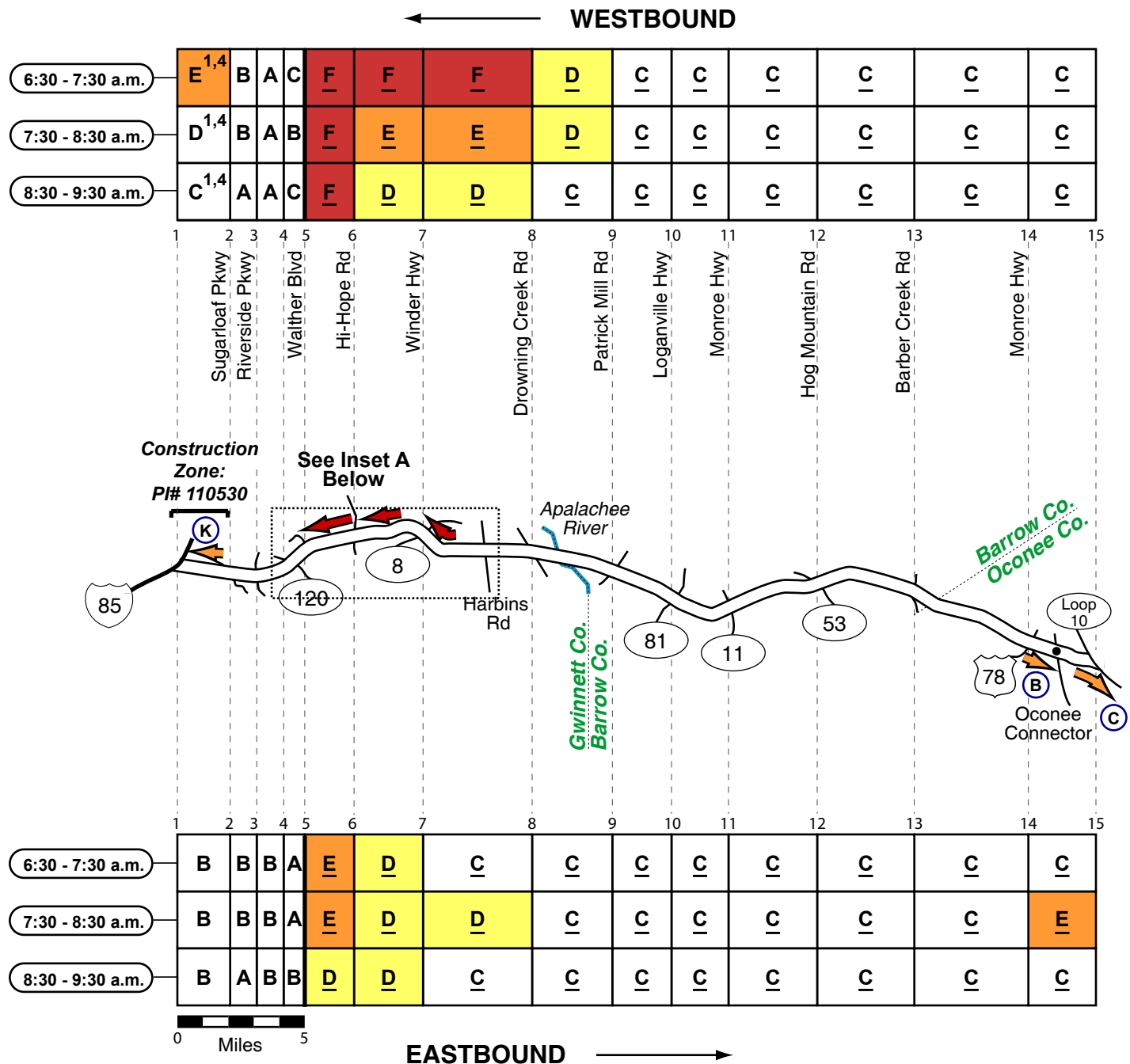
I

Congestion Type: Congested Cross Road
Location: Camp Creek Parkway
Frequency: Peak Hour
Direction: Eastbound
Queue Population: 25 to 35 vpl
Number of Lanes: One Left-Turn Lane

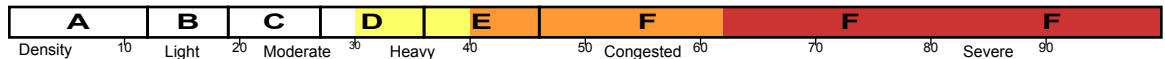
L

Congestion Type: Exit Ramp Queue
Location: SR 155 (Flat Shoals Rd)
Frequency: Peak Hour
Direction: Eastbound
Queue Population: 20 to 30 vpl
Number of Lanes: One Right-Turn Lane

SR 316 (Gwinnett/Barrow & Oconee Counties) - Morning



Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).² Type 2 nested congestion (more severe in left or right-hand lanes).³ Type 3 nested congestion (present only in the first or second half-hour period).⁴ Type 4 nested congestion (partial length of segment).

SR 316 (Gwinnett/Barrow & Oconee Counties) - Morning

A

Congestion Type: Signal Queue
 Location: SR 20/SR 124
 Frequency: Intermittent
 Direction: Eastbound
 Queue Populations: 20 to 25 vpl
 Number of Lanes: 2

B

Congestion Type: Signal Queue
 Location: Oconee Connector
 Frequency: Intermittent
 Direction: Eastbound
 Queue Populations: 20 to 25 vpl
 Number of Lanes: 2

C

Congestion Type: Platoons
 Location: Approaching Loop 10
 Frequency: Peak Hour
 Direction: Eastbound
 Platoon Populations: 20 to 30 vpl
 Number of Lanes: 1

Note: During some observations, eastbound congestion was found in the right lane (dedicated lane for vehicles entering the ramp to eastbound Loop 10) between Oconee Connector and SR 10.

D

Congestion Type: Signal Queue
 Location: Harbins Rd
 Frequency: Most observations before 8:00 a.m.
 Direction: Westbound
 Queue Populations: 25 to 50 vpl
 Number of Lanes: 2

E

Congestion Type: Signal Queue
 Location: SR 8 (Winder Hwy)
 Frequency: Most observations before 8:00 a.m.
 Direction: Westbound
 Queue Populations: 25 to 70 vpl
 Number of Lanes: 2

F

Congestion Type: Congested Cross Road
 Location: Harbins Rd
 Frequency: Most observations before 8:00 a.m.
 Direction: Northbound
 Queue Populations: 25 to 50 vpl
 Number of Lanes: 1

G

Congestion Type: Signal Queue
 Location: Hi-Hope Rd
 Frequency: Most observations
 Direction: Westbound
 Queue Populations: 25 to 60 vpl
 Number of Lanes: 2

H

Congestion Type: Signal Queue
 Location: SR 20
 Frequency: Most observations
 Direction: Westbound
 Queue Populations: 25 to 70 vpl
 Number of Lanes: 2

I

Congestion Type: Signal Queue
 Location: Collins Hill Rd
 Frequency: Most observations
 Direction: Westbound
 Queue Populations: 20 to 45 vpl
 Number of Lanes: 2

J

Congestion Type: Congested Cross Road
 Location: SR 20
 Frequency: Most observations
 Direction: Southbound
 Queue Populations: 20 to 30 vpl
 Number of Lanes: 2

K

Congestion Type: Mainline Congestion
 Frequency: Most observations before 8:00 a.m.
 Direction: Westbound
 Location: Between Sugarloaf Pkwy and I-85
 Queue Length: 1 to 2 miles
 Estimated Speed: 20 to 40 mph
 Potential Cause(s): During the Fall 2007 aerial survey, the SR 316 / I-85 Interchange was under construction. During the earlier survey flights, there was a lane drop (2 lanes to 1) in the construction zone; later in the survey, three lanes were available for vehicles heading southbound at the terminus of SR 316 (two lanes to I-85; one lane to the I-85 service road). Westbound congestion was found on SR 316 approaching the I-85 Interchange during the earlier flights when the lane drop was present; westbound congestion was not found on SR 316 during the survey flights when three lanes were available for southbound vehicles.

Construction Zone

PI# 110530

Description: Interchange construction at I-85

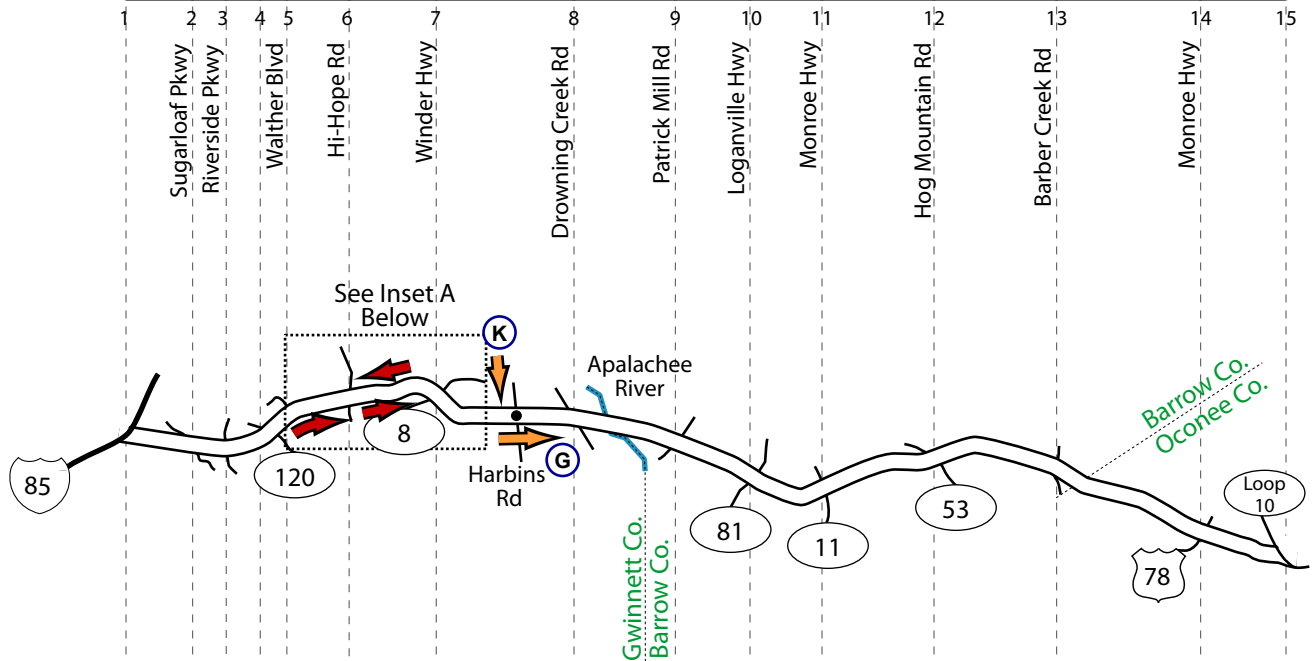
Traffic Quality Rating

| <u>A</u> | <u>B</u> | <u>C</u> | <u>D</u> | <u>E</u> | <u>F</u> |
|------------|----------|----------|----------|-----------|----------|
| Very Light | Light | Moderate | Heavy | Congested | Severe |

SR 316 (Gwinnett/Barrow & Oconee Counties) - Evening

← WESTBOUND

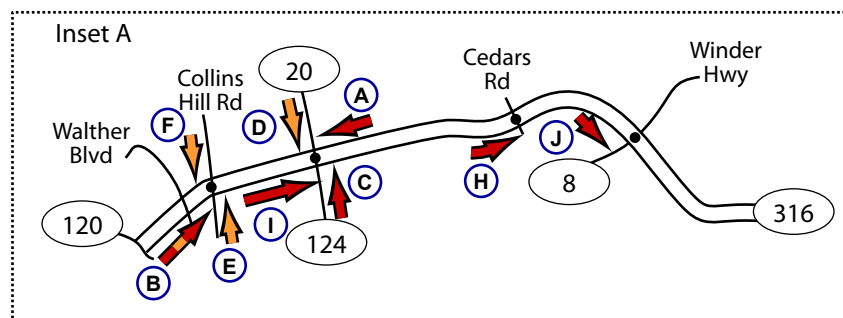
| | | | | | | | | | | | | | | |
|------------------|---|---|---|---|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| 4:00 - 5:00 p.m. | A | A | A | A | <u>E</u> | <u>D</u> | <u>D</u> | <u>C</u> | <u>C</u> | <u>C</u> | <u>C</u> | <u>C</u> | <u>C</u> | <u>C</u> |
| 5:00 - 6:00 p.m. | B | A | A | A | <u>E</u> | <u>D</u> | <u>D</u> | <u>D</u> | <u>C</u> | <u>D</u> | <u>D</u> | <u>C</u> | <u>C</u> | <u>D</u> |
| 6:00 - 7:00 p.m. | B | A | A | B | <u>F</u> | <u>C</u> | <u>D</u> | <u>C</u> | <u>C</u> | <u>C</u> | <u>C</u> | <u>C</u> | <u>C</u> | <u>C</u> |



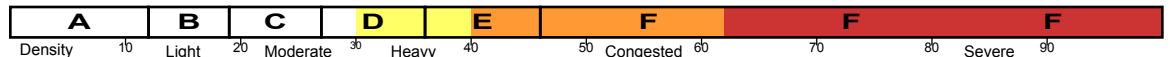
| | | | | | | | | | | | | | | |
|------------------|---|---|-----------------|-----------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| 4:00 - 5:00 p.m. | C | B | C | ¹ 65 | <u>F</u> | <u>E</u> | <u>E</u> | <u>D</u> | <u>D</u> | <u>D</u> | <u>C</u> | <u>C</u> | <u>C</u> | <u>D</u> |
| 5:00 - 6:00 p.m. | D | C | ¹ 70 | ¹ 70 | <u>F</u> | <u>E</u> | <u>E</u> | <u>D</u> | <u>D</u> | <u>D</u> | <u>D</u> | <u>D</u> | <u>C</u> | <u>D</u> |
| 6:00 - 7:00 p.m. | C | B | B | ¹ 50 | <u>F</u> | <u>E</u> | <u>E</u> | <u>D</u> | <u>C</u> | <u>C</u> | <u>C</u> | <u>C</u> | <u>C</u> | <u>D</u> |

0 Miles 5

→ EASTBOUND



Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

SR 316 (Gwinnett/Barrow & Oconee Counties) - Evening

A

Congestion Type: Signal Queue
 Location: SR 20
 Frequency: Intermittent
 Direction: Westbound
 Queue Populations: 20 to 60 vpl
 Number of Lanes: 2

B

Congestion Type: Signal Queue
 Location: Collins Hill Rd
 Frequency: Most observations
 Direction: Eastbound
 Queue Populations: 20 to 150 vpl
 Number of Lanes: 2
 Note: During most observations, eastbound congestion approaching the signal at Collins Hill Rd extended back to the vicinity of SR 120 (a distance of approximately 1.5 miles).

C

Congestion Type: Congested Cross Road
 Location: SR 20
 Frequency: Most observations
 Direction: Northbound
 Queue Populations: 20 to 50 vpl
 Number of Lanes: 2
 Note: During some observations, northbound congestion approaching SR 316 extended back through the upstream signal at Hurricane Shoals Rd.

D

Congestion Type: Congested Cross Road
 Location: SR 20
 Frequency: Intermittent
 Direction: Southbound
 Queue Populations: 20 to 40 vpl
 Number of Lanes: 2

E

Congestion Type: Congested Cross Road
 Location: Collins Hill Rd
 Frequency: Intermittent
 Direction: Northbound
 Queue Populations: 20 to 30 vpl
 Number of Lanes: 1

F

Congestion Type: Congested Cross Road
 Location: Collins Hill Rd
 Frequency: Intermittent
 Direction: Southbound
 Queue Populations: 20 to 30 vpl
 Number of Lanes: 1

G

Congestion Type: Platoons
 Location: Between SR 8 (Winder Hwy) and Drowning Creek Rd
 Frequency: Most observations
 Direction: Eastbound
 Queue Populations: 25 to 35 vpl
 Number of Lanes: 2

H

Congestion Type: Signal Queue
 Location: Cedars Rd
 Frequency: Peak Hour
 Direction: Eastbound
 Queue Populations: 20 to 40 vpl
 Number of Lanes: 2

I

Congestion Type: Signal Queue
 Location: SR 20
 Frequency: Most observations
 Direction: Eastbound
 Queue Populations: 20 to 40 vpl
 Number of Lanes: 2

J

Congestion Type: Signal Queue
 Location: SR 8 (Winder Hwy)
 Frequency: Most observations
 Direction: Eastbound
 Queue Populations: 20 to 35 vpl
 Number of Lanes: 2

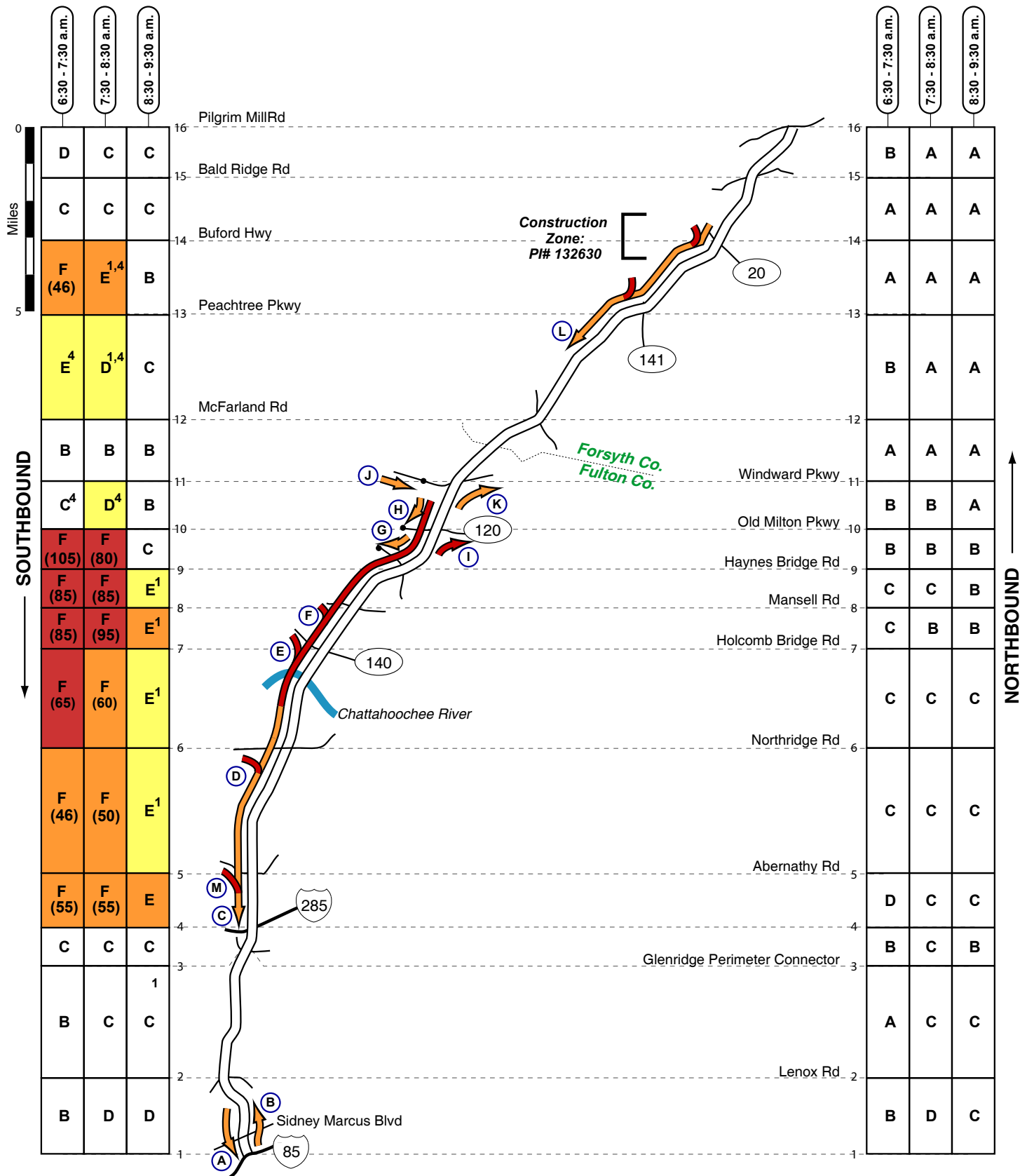
K

Congestion Type: Congested Cross Road
 Location: Harbins Rd
 Frequency: Intermittent
 Direction: Southbound
 Queue Populations: 20 to 25 vpl
 Number of Lanes: 1

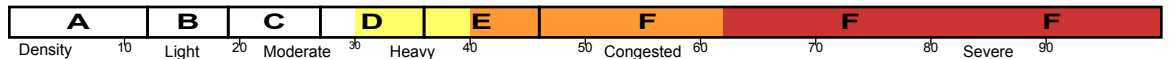
Traffic Quality Rating

| <u>A</u> | <u>B</u> | <u>C</u> | <u>D</u> | <u>E</u> | <u>F</u> |
|------------|----------|----------|----------|-----------|----------|
| Very Light | Light | Moderate | Heavy | Congested | Severe |

SR 400 (Forsyth & Fulton Counties) - Morning



Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

SR 400 (Forsyth & Fulton Counties) - Morning

A

Congestion Type: Mainline Congestion
Frequency: Intermittently after 7:30 a.m.
Direction: Southbound
Location: Between Lenox Rd and I-85
Queue Length: 1 to 2 miles
Estimated Speed: 30 to 50 mph
Potential Cause(s): The head of the queue was found at the merge into congested flow on I-85 at the SR 400 terminus.

B

Congestion Type: Mainline Congestion
Frequency: Intermittently after 8:00 a.m.
Direction: Northbound
Location: Between I-85 and Lenox Rd
Queue Length: 1 to 2 miles
Estimated Speed: 40 to 50 mph
Potential Cause(s): Merging associated with the Sidney Marcus Blvd and Lenox Rd interchanges.

C

Congestion Type: Mainline Congestion
Frequency: Most observations
Direction: Southbound
Location: Between Windward Parkway and I-285
Queue Length: 12 to 14 miles
Potential Cause(s): Factors contributing to the congestion were: 1) traffic entering at the Mansell Rd, Holcomb Bridge Rd, Northridge Rd and Abernathy Rd interchanges; 2) the lane drop (4 lanes to 3) at the I-285 interchange.

D

Congestion Type: Entrance Ramp Queue
Location: Northridge Rd
Frequency: Peak Hour
Direction: Southbound
Queue Population: 30 to 40 vpl
Number of Lanes: One / Two
Note: The head of the ramp queue was at the ramp meter; the lane drop (2 lanes to 1) on the entrance ramp appeared to exacerbate the congestion.

E

Congestion Type: Entrance Ramp Queue
Location: Holcomb Bridge Rd
Frequency: Peak Hour
Direction: Southbound
Queue Population: 30 to 50 vpl
Number of Lanes: Four / Two
Note: The head of the ramp queue was found where vehicles merged into the mainline on SR 400; the lane drop (4 lanes to 2) on the entrance ramp appeared to exacerbate the congestion.

F

Congestion Type: Entrance Ramp Queue
Location: Mansell Rd
Frequency: Peak Hour
Direction: Southbound
Queue Population: 40 to 60 vpl
Number of Lanes: Three / Two / One
Note: The head of the ramp queue was found where vehicles merged into the mainline on SR 400; the lane drops (3 lane to 2 and 2 lanes to 1) on the entrance ramp appeared to exacerbate the congestion.

G

Congestion Type: Exit Ramp Queue
Location: Haynes Bridge Rd
Frequency: Intermittent
Direction: Southbound
Queue Population: 20 to 30 vpl
Number of Lanes: One Left-Turn Lane (North-westbound)

H

Congestion Type: Exit Ramp Queue
Location: SR 120 (Old Milton Pkwy)
Frequency: Peak Hour
Direction: Southbound
Queue Population: 30 to 40 vpl
Number of Lanes: Two Left-Turn Lanes

I

Congestion Type: Exit Ramp Queue
Location: SR 120 (Old Milton Pkwy)
Frequency: Peak Hour
Direction: Northbound
Queue Population: 40 to 60 vpl
Number of Lanes: One
Note: When congested, vehicles were queued in the right lane on the ramp; vehicles at the head of the ramp waited to merge into eastbound flow on SR 120. Congestion typically extended back into the right shoulder of SR 400; thru-traffic on SR 400 appeared to bypass the queue without delay.

J

Congestion Type: Congested Cross Road
Location: Windward Parkway
Frequency: Intermittent
Direction: Eastbound
Queue Population: 20 to 30 vpl
Number of Lanes: Two

K

Congestion Type: Exit Ramp Queue
Location: Windward Parkway
Frequency: Intermittent
Direction: Northbound
Queue Population: 20 to 30 vpl
Number of Lanes: Two Left-Turn Lanes

L

Congestion Type: Mainline Congestion
Frequency: Most observations
Direction: Southbound
Location: Between Bald Ridge Rd and McFarland Rd
Queue Length: 8 to 9 miles
Potential Cause(s): Traffic entering at Buford Highway and SR 141 appeared to contribute to the congestion; while congestion persisted south of SR 141, traffic flow typically improved.

M

Congestion Type: Entrance Ramp Queue
Location: Abernathy Rd
Frequency: Peak Hour
Direction: Southbound
Queue Population: 20 to 30 vpl
Number of Lanes: One
Note: The head of the ramp queue was found where vehicles merged into the mainline on SR 400.

Construction Zone

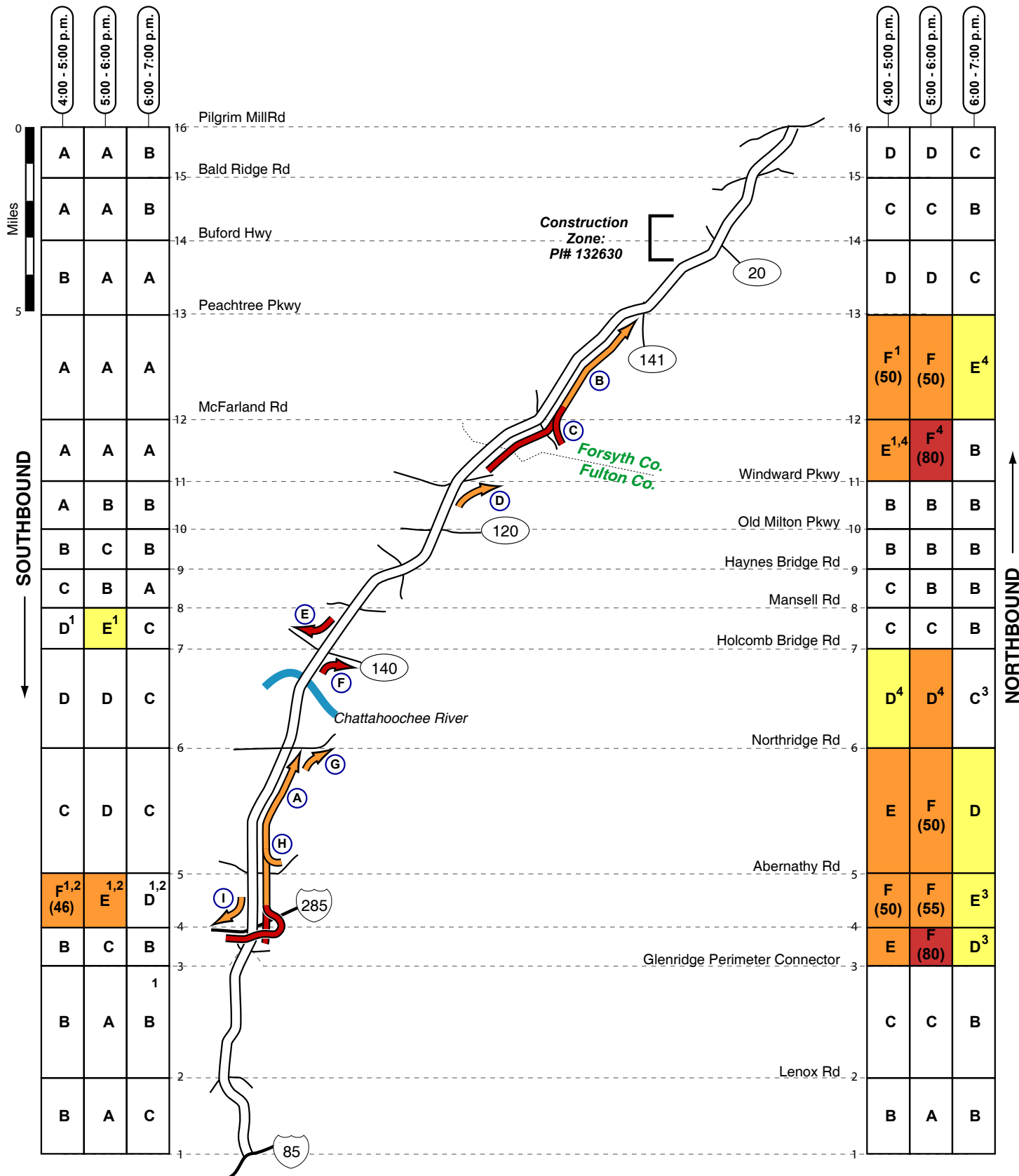
PI# 132630

Description: Interchange construction at SR 20

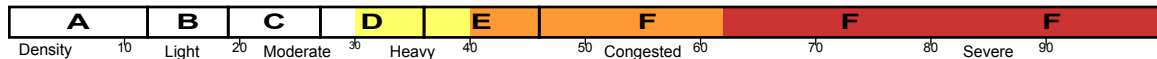
Traffic Quality Rating

| A | B | C | D | E | F |
|------------|-------|----------|-------|-----------|--------|
| Very Light | Light | Moderate | Heavy | Congested | Severe |

SR 400 (Forsyth & Fulton Counties) - Evening



Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

SR 400 (Forsyth & Fulton Counties) - Evening

A

Congestion Type: Mainline Congestion
 Frequency: Most observations before 6:30 p.m.
 Direction: Northbound
 Location: Between the Glenridge Perimeter Connector and Northridge Rd
 Queue Length: 5 to 6 miles
 Estimated Speed: 30 to 50 mph
 Potential Cause(s): Congestion appeared to be caused by traffic entering the mainline from eastbound I-285 and Abernathy Rd.

B

Congestion Type: Mainline Congestion
 Frequency: Most observations before 6:30 p.m.
 Direction: Northbound
 Location: Between Windward Parkway and SR 141
 Queue Length: 5 to 7 miles
 Estimated Speed: 30 to 50 mph
 Potential Cause(s): Factors contributing to the congestion included: 1) the series of lane drops (4 lanes to 3 and 3 lanes to 2) approaching McFarland Rd and; 2) traffic entering at McFarland Rd.

C

Congestion Type: Entrance Ramp Queue
 Location: McFarland Rd
 Frequency: Peak Hour
 Direction: Northbound
 Queue Population: 25 to 45 vpl
 Number of Lanes: One / Two
 Note: The head of the ramp queue was found where vehicles merged into the mainline on SR 400; the lane drop (2 lanes to 1) on the entrance ramp appeared to exacerbate the congestion.

D

Congestion Type: Exit Ramp Queue
 Location: Windward Parkway
 Frequency: Intermittent
 Direction: Northbound
 Queue Population: 20 to 25 vpl
 Number of Lanes: Two Left-Turn Lanes

E

Congestion Type: Exit Ramp Queue
 Location: Holcomb Bridge Rd
 Frequency: Peak Hour
 Direction: Southbound
 Queue Population: 40 to 50 vpl
 Number of Lanes: One
 Note: When congested, vehicles were queued in the right lane on the ramp; vehicles at the head of the ramp waited to merge into westbound flow on Holcomb Bridge Rd.

F

Congestion Type: Exit Ramp Queue
 Location: Holcomb Bridge Rd
 Frequency: Peak Hour
 Direction: Northbound
 Queue Population: 40 to 50 vpl
 Number of Lanes: One
 Note: When congested, vehicles were queued in the right lane on the ramp; vehicles at the head of the ramp waited to merge into eastbound flow on Holcomb Bridge Rd. Congestion typically extended back into the right lane of SR 400; thru-traffic on SR 400 appeared to bypass the queue without delay.

G

Congestion Type: Exit Ramp Queue
 Location: Northridge Rd
 Frequency: Peak Hour
 Direction: Northbound
 Queue Population: 25 to 30 vpl
 Number of Lanes: One

H

Congestion Type: Entrance Ramp Queue
 Location: Abernathy Rd
 Frequency: Peak Hour
 Direction: Northbound
 Queue Population: 40 to 50 vpl
 Number of Lanes: One / Two
 Note: The head of the ramp queue was found where vehicles merged into the mainline on SR 400; the lane drop (2 lanes to 1) on the entrance ramp appeared to exacerbate the congestion.

I

Congestion Type: Mainline Congestion
 Frequency: On some days but not others
 Direction: Southbound
 Location: Between Abernathy Rd and I-285
 Queue Length: 1 to 1.5 miles
 Estimated Speed: 30 to 50 mph
 Potential Cause(s): The head of the queue was found on the ramp to I-285 (westbound); congestion typically extended back into the right two lanes on SR 400 (thru-traffic in the left lanes appeared to bypass the queue with little or no delay).

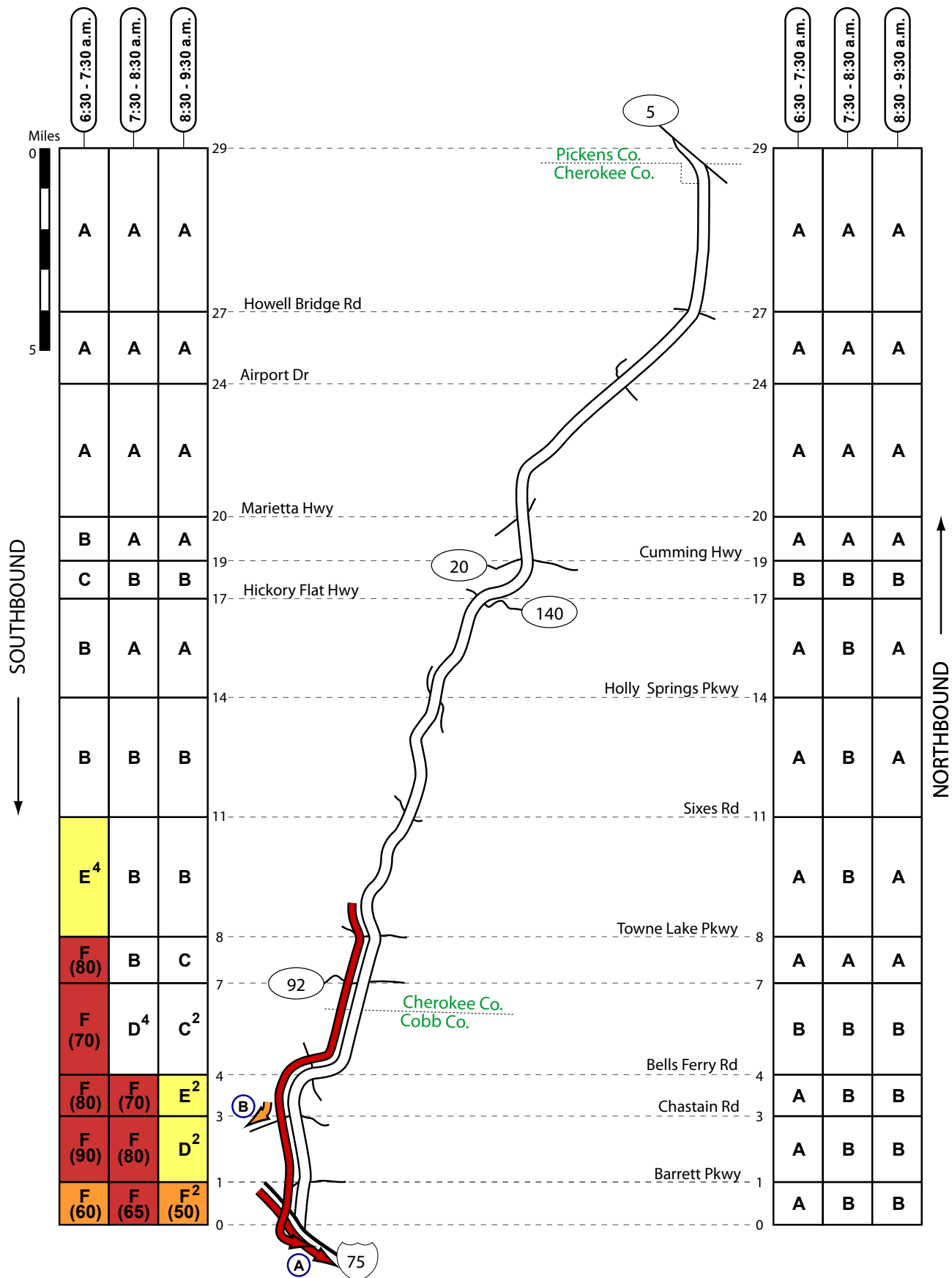
Construction Zone

PI# 132630
 Description: Interchange construction at SR 20

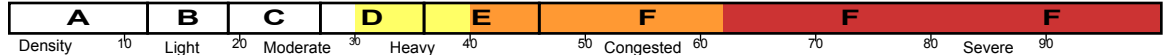
Traffic Quality Rating

| A | B | C | D | E | F |
|------------|-------|----------|-------|-----------|--------|
| Very Light | Light | Moderate | Heavy | Congested | Severe |

I-575 (Cherokee & Cobb Counties) - Morning



Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

I-575 (Cherokee & Cobb Counties) - Morning

A

Congestion Type: Mainline Congestion

Frequency: Most observations before 9:00 a.m.

Direction: Southbound

Location: Between Sixes Rd and I-75

Queue Length: 3 to 9 miles

Estimated Speed: 20 to 45 mph

Potential Cause(s): During the peak hour (6:30-7:30 a.m.), the tail of the queue on I-575 was typically found between Towne Lake Pkwy and Sixes Rd; between 7:30 and 9:00 a.m., the tail of the queue was typically found between Bells Ferry Rd and SR 92. Traffic entering at the interchanges along this section of I-575 appeared to exacerbate congestion.

B

Congestion Type: Exit Ramp Queue

Location: Chastain Rd

Frequency: Intermittent

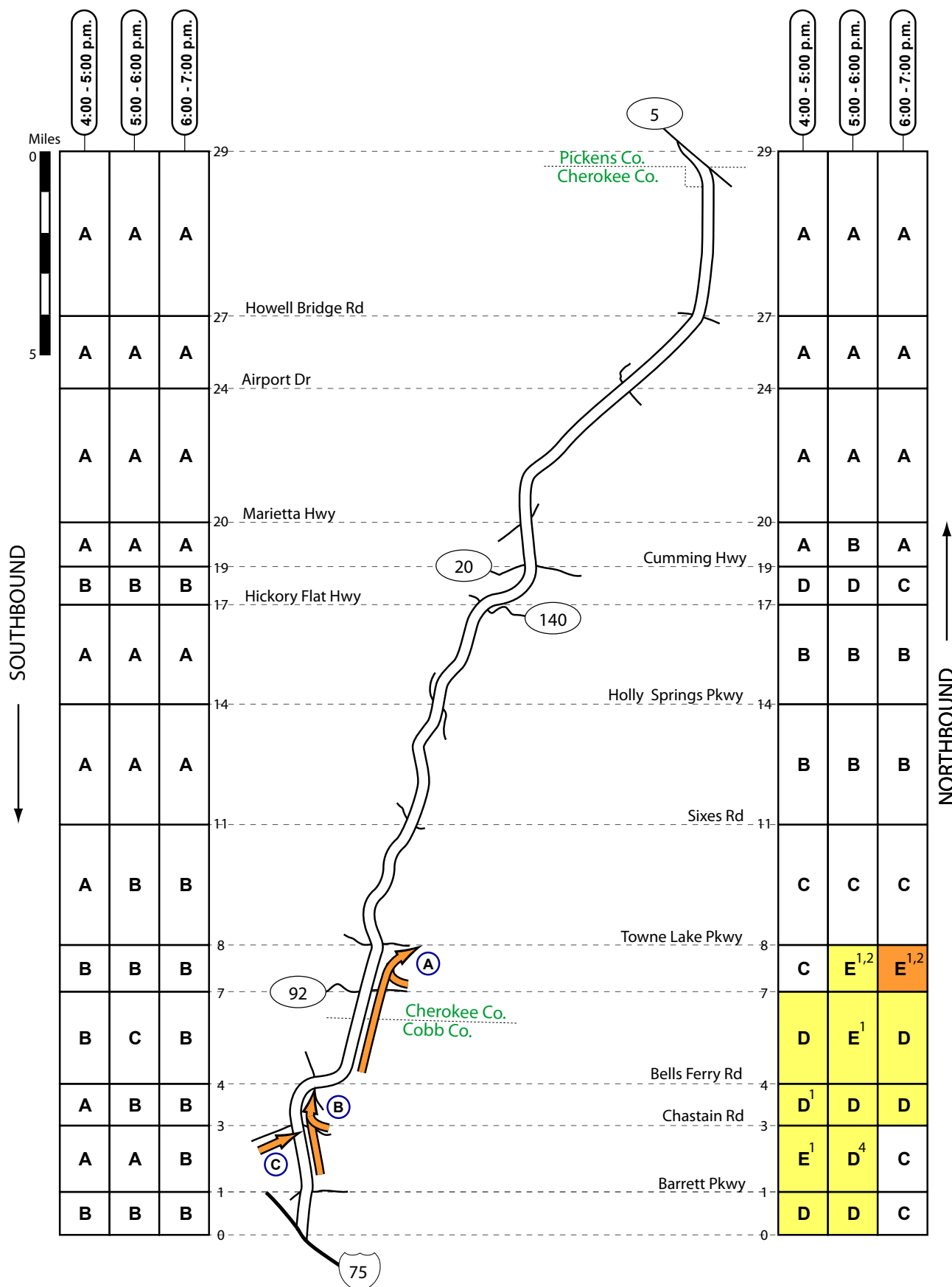
Direction: Southbound

Queue Population: 20 to 30 vpl

Number of Lanes: One

Note: When congested, vehicles were queued in the right lane; vehicles at the head of the ramp waited to merge into westbound flow on Chastain Rd.

I-575 (Cherokee & Cobb Counties) - Evening



Traffic Quality Rating

A

B

C

D

E

F

F

F

Density

10

Light

20

Moderate

30

Heavy

40

50

Congested

60

70

80

Severe

90

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

I-575 (Cherokee & Cobb Counties) - Evening

A

Congestion Type: Mainline Congestion

Frequency: Intermittently after 4:30 p.m.

Direction: Northbound

Location: Between Bells Ferry Rd and Towne Lake Pkwy

Queue Length: 3 to 4 miles

Estimated Speed: 35 to 50 mph

Potential Cause(s): The head of the queue was found on the ramp to Towne Lake Parkway; congestion extended back into the right lane (and eventually across both lanes) of I-575.

B

Congestion Type: Mainline Congestion

Frequency: Intermittently before 5:30 p.m.

Direction: Northbound

Location: Between Barrett Pkwy and Bells Ferry Rd

Queue Length: 2 to 3 miles

Estimated Speed: 40 to 50 mph

Potential Cause(s): Traffic entering at Chastain Rd

C

Congestion Type: Congested Cross Road

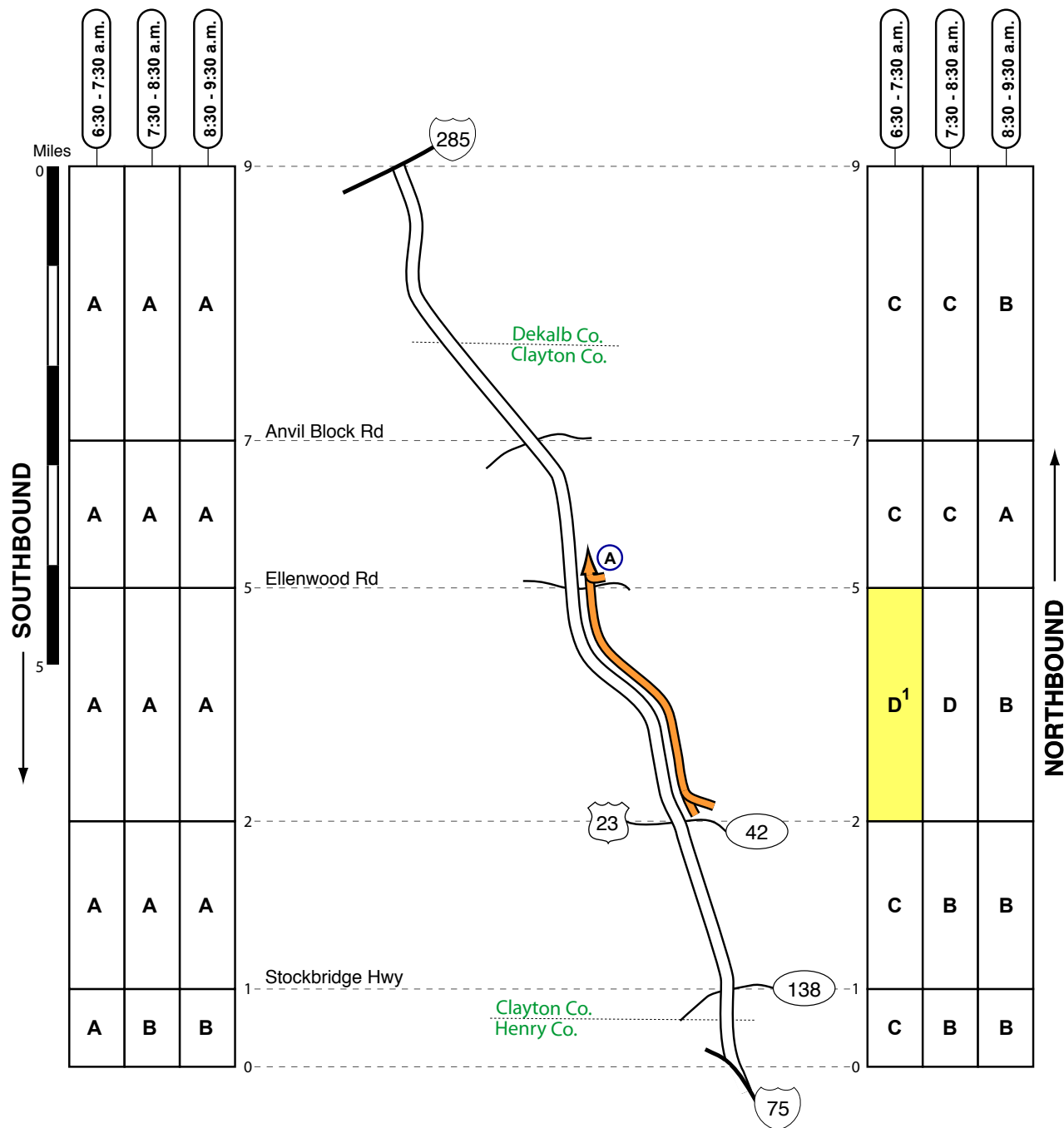
Location: Chastain Rd

Frequency: Intermittent

Direction: Eastbound

Queue Population: 20 to 25 vpl

Number of Lanes: Two Left-Turn Lanes

I-675 (DeKalb/Clayton & Henry Counties) - Morning

A

Congestion Type: Mainline Congestion

Frequency: Intermittently before 7:30 a.m.

Direction: Northbound

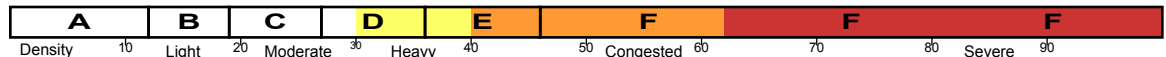
Location: Between SR 42 and Ellenwood Rd

Queue Length: 2 to 3 miles

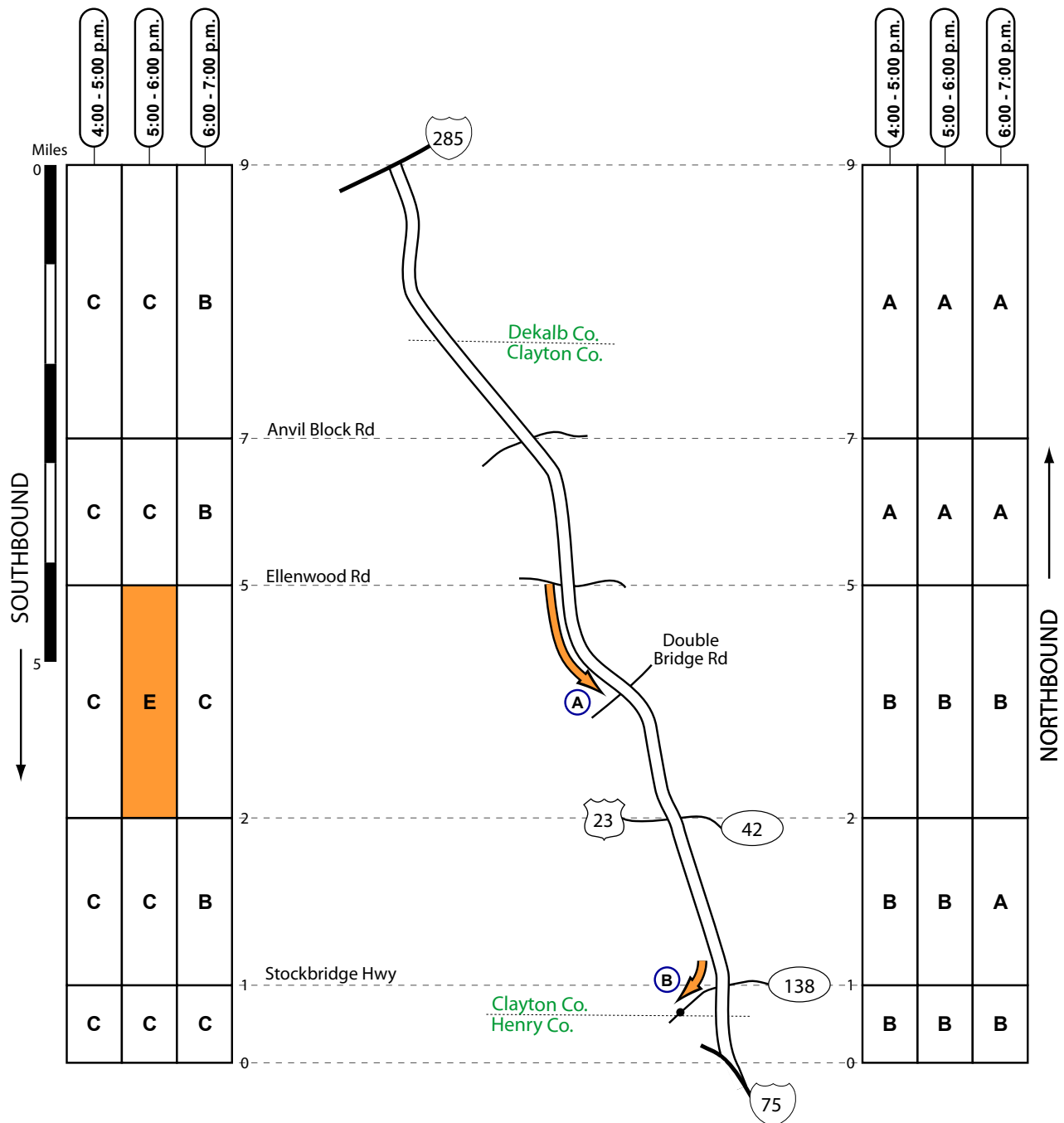
Estimated Speed: 40 to 50 mph

Potential Cause(s): Factors contributing to the congestion were: 1) the geometrics of the road (sharp bends) and; 2) traffic entering at the SR 42 and Ellenwood Rd interchanges.

Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

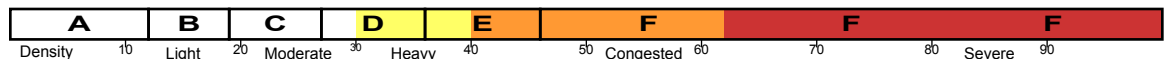
I-675 (DeKalb/Clayton & Henry Counties) - Evening



A
 Congestion Type: Mainline Congestion
 Frequency: Peak Hour
 Direction: Southbound
 Location: Between Ellenwood Rd and SR 42
 Queue Length: 1 to 2 miles
 Estimated Speed: 30 to 50 mph
 Potential Cause(s): Lane drop (3 lanes to 2) at Double Bridge Rd

B
 Congestion Type: Exit Ramp Queue
 Location: Stockbridge Hwy
 Frequency: Intermittent
 Direction: South-eastbound
 Queue Population: 20 to 40 vpl
 Number of Lanes: One Left-Turn Lane

Traffic Quality Rating



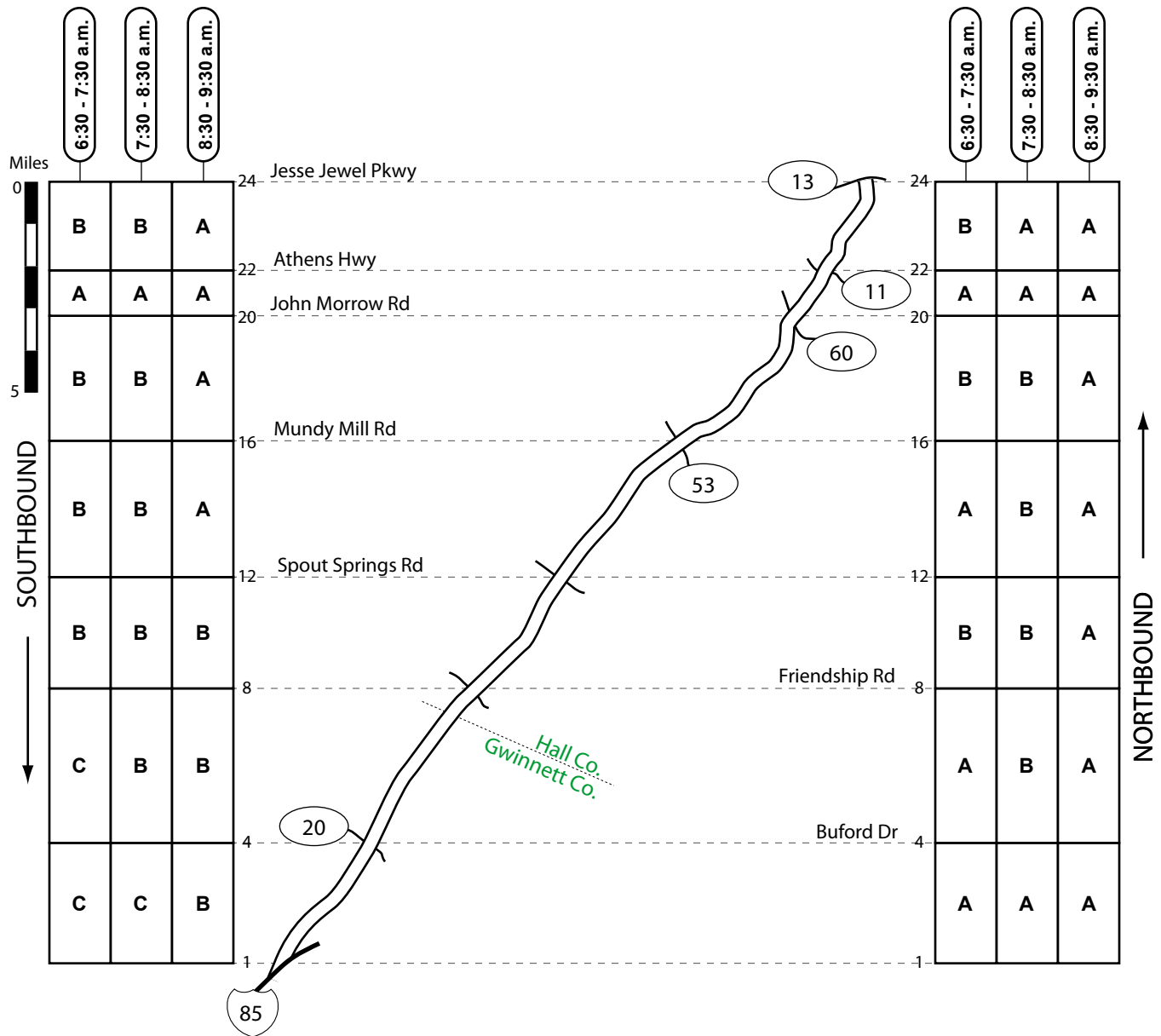
Superscripts: ¹ Type 1 nested congestion (some days, not others).

² Type 2 nested congestion (more severe in left or right-hand lanes).

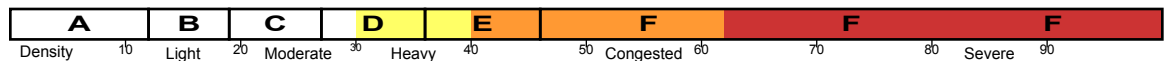
³ Type 3 nested congestion (present only in the first or second half-hour period).

⁴ Type 4 nested congestion (partial length of segment).

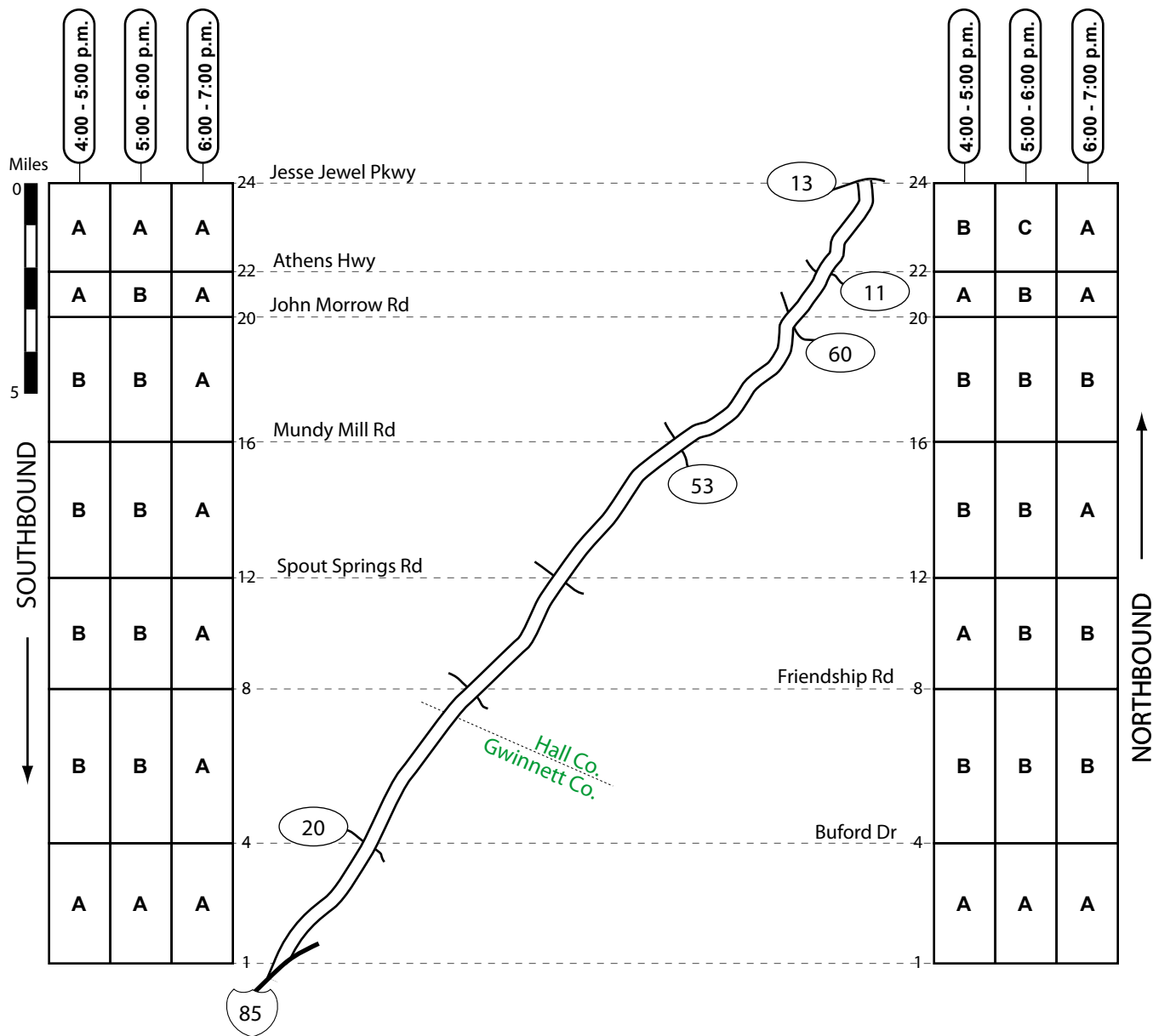
I-985 (Hall & Gwinnett Counties) - Morning



Traffic Quality Rating

Superscripts: ¹ Type 1 nested congestion (some days, not others).³ Type 3 nested congestion (present only in the first or second half-hour period).² Type 2 nested congestion (more severe in left or right-hand lanes).⁴ Type 4 nested congestion (partial length of segment).

I-985 (Hall & Gwinnett Counties) - Evening



Traffic Quality Rating



APPENDIX A, VOLUME ONE

PROCEDURE FOR DETERMINING FREEWAY LEVEL-OF-SERVICE

Introduction

Overlapping aerial photography can document many useful characteristics of traffic flow on highway networks. The photographs can be invaluable for screening problem sites, winning support for ideas, and explaining decisions to others. If formal rules and procedures are applied to the analysis of aerial photographs, the photography can provide a cost-effective basis for periodically rating the performance of large highway systems on a link-by-link basis.

Background

On motorized vehicle highways, traffic flow is normally measured in terms of three basic parameters: *volume*, *speed*, and *density*. These parameters are related mathematically such that, if only two are known, the third can be calculated (volume equals speed times density). Other useful flow parameters related to speed are *travel time* and *delay* between specific points on a system.

The *Highway Capacity Manual (HCM)*, updated in 2000 by the Transportation Research Board of the National Research Council, is an authoritative governmental resource that has established a simplified concept by which the performance of all types of transportation facilities can be described and compared. This concept is called *level of service*, or *LOS*. For each type of facility, a single traffic flow parameter – the one deemed most appropriate by the committee that publishes the manual – is chosen to be the basis for defining six rating categories. These categories are represented by the letters “A” through “F”, ranging from the most favorable rating of LOS A (indicating high service quality associated with lightly-used facilities) to the poorest rating of LOS F (indicating a facility burdened by congestion or other undesirable performance characteristics). This LOS system, introduced in 1965 version of the HCM and revised periodically since, has been widely adopted for evaluating existing highway systems and planning future improvements. Because six LOS classes are easier to understand than tables of numbers, LOS has been widely used in the political process. In some jurisdictions, LOS standards are even found in legislation attempting to guide facility planning or control real estate development.

Uninterrupted-flow highways (grade-separated highways without signals)

Summary

The defining parameter for HCM LOS on freeways and other uninterrupted-flow highways is the *density* of traffic flow (in units of passenger cars per lane per mile). Density was chosen as the basis for HCM LOS because, when traffic flows without interruption, traffic density relates mathematically to both speed and volume. This means that a single LOS measure based on density provides not only general speed information, but also provides an approximation of how heavily the facility is utilized. It also indicates where demand has exceeded capacity, resulting in congestion and delays. (Speed is less desirable as a defining basis for LOS because uninterrupted-flow highways can process high volumes of traffic at high speeds; ratings based on speed alone might not differentiate clearly between facilities that were heavily or lightly utilized.) The most common way to determine LOS on an existing freeway is to measure the speed and volume of the traffic, and then calculate the density. Another method is to determine density directly from aerial photographs, which allows for cost effective data collection across very large highway networks. (This also affords the other benefits of aerial photography, which often shows the underlying causes of congestion as well as conditions on interchange ramps, merges and crossroads.) Accordingly, when

Skycomp evaluates the performance of uninterrupted-flow highway facilities, Skycomp derives traffic densities from aerial photographs and then determines density-based HCM LOS ratings.

As discussed above, the LOS rating system uses the letters “A” through “F” to describe traffic conditions: LOS “A” represents superior traffic conditions (very light traffic), while LOS “F” represents poor traffic conditions (congested flow involving various degrees of delay). These letters are assigned based on how densely cars are traveling on the road. Research has shown that for all densities below 40 pcplpm, vehicles generally move at or close to normal highway speed; LOS “A” through “E” represent these densities according to the following table (pcplpm):

- LOS “A”:** densities from **zero to 11** (very light traffic);
- LOS “B”:** densities from **12 to 18** (light to moderate traffic);
- LOS “C”:** densities from **19 to 26** (moderate traffic);
- LOS “D”:** densities from **27 to 35** (moderate to heavy traffic);
- LOS “E”:** densities from **36 to approx. 45** (heavy traffic, but still at speeds close to free-flow)

At densities greater than **40**, speeds typically decrease and traveler delays are incurred. Because flow at all densities greater than **46** (approximately) are regarded as LOS “F”, this report attaches actual densities to all LOS “F” ratings. Accordingly:

- LOS “F”:**
- Densities from **46 to 60** indicate delay involving minor degrees of slowing; average speeds usually range between 50 and 30 mph;
 - Densities from **60 to 80** indicate traffic flow at average speeds usually ranging between 40 and 15 mph;
 - Densities from **80 to 100** indicate congested traffic flow, with some stopping possible; average speeds usually range between 10 and 25 mph;
 - Densities above **100** indicate severe congestion, with considerable stop-and-go flow likely. For reference, densities above 120 almost always indicate the presence of unusual events (accidents, roadwork, etc.). The practical maximum value for density measurements is **180**; the theoretical maximum value is **264** (at 20 feet per vehicle).

Data Reduction Procedures

From overlapping time-stamped photographs, densities by highway segment were determined by manual counts taken along the entire segment length. Vehicles were classified as cars, trucks, buses, or tractor-trailers when counted; later, passenger-car equivalents (pce’s) were derived according to the following table:

| <u>Vehicle type:</u> | <u>PCE’s:</u> |
|----------------------|---------------|
| cars | 1 |
| buses | 1.5 |
| trucks | 1.5 |
| tractor-trailers | 2.0 |

Data that were atypical due to roadwork or to known or suspected incidents were coded for exclusion from the averaging process. All data were then entered into a microcomputer database program, which performed the following tasks: 1) samples were grouped by time slice; 2) average densities were calculated; and 3) densities were converted into service levels “A” through “F”. The computer then prepared matrices showing each averaged service level rating plotted by time and highway segment. These data matrices were then copied into

the traffic quality tables, which are provided in this report.

In the tables, all LOS F conditions (congested traffic flow) have been darkly shaded; this permits quick identification of locations experiencing demand at levels exceeding capacity. Because LOS “F” encompasses a wide range of densities, the actual density values are entered next to the “F”; using the travel characteristics in the density ranges provided above, the nature of the flow in LOS F segments can be determined.

While examining the photography, data technicians also identified side streets and on/off ramps that were congested. Where these problems were recurring, descriptive narratives were prepared.

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APPENDIX B

METHODOLOGY DESCRIPTION

Procedures for obtaining speed/density samples for calibration of
the Van Aerde Speed / Density Model

BACKGROUND

In the spring of 1995, Skycomp collected data to compare the speed of vehicles through congested freeway zones with corresponding densities obtained from aerial photographs. The purpose was to explore the relationship between the two, and, given a reasonable correlation, to prepare a model by which vehicle speeds could be estimated from aerial density photographs.

The program was conceived and executed by the Metropolitan Washington (D.C.) Council of Governments (MWCOC). Aerial data were collected by Skycomp; analysis of the data and calibration of the Van Aerde speed/density model were conducted by MWCOC (draft paper included in this appendix).

A secondary objective was to evaluate the accuracy of aerial speed and density measurements by comparing them to data collected by traditional methods (floating cars and loop detectors embedded in the pavement).

Accordingly, segments of freeway were chosen to be surveyed that: 1) were expected to generate congested traffic flow; and 2) either contained a loop detector station or would accommodate quick turnarounds for multiple floating car runs. Thus, while data were being collected in the air (290 speed samples were obtained from the air, along with corresponding densities), loop detector or floating car data were collected concurrently on the ground.

The outcome of this study was a finding that travel speeds across congested freeway segments could be determined with reasonable accuracy using only aerial density photographs. It was also found that speeds and densities obtained through aerial techniques closely matched data obtained using the traditional ground methods.

PROCEDURES TO OBTAIN SPEED / DENSITY SAMPLES:

The observer/photographer followed the following procedure to obtain all speed/density samples: he first flew along the selected survey segment while taking time-stamped overlapping density photographs of the entire segment; next, at the upstream end, he selected a target “floating” car for tracking; he photographed the target as it entered and departed the segment, while simultaneously timing its run to the nearest second. He then took an “after” density photo set; and then recorded the following information on a clipboard: the time of the sample, the target vehicle description, lane(s) traveled, elapsed time, and any special notes. This procedure was repeated for each speed/density data point.

In the actual course of sampling, this procedure was modified in several ways. First, where cars were moving at high (free-flow) speeds, the density did not change significantly between samples; thus sometimes three or more floating cars were timed between density runs.

Another modification done in-flight is as follows: the observer noted in several cases that the density set taken before the target vehicle went through better reflected the conditions the car encountered than the density set taken after the vehicle went through (or vice versa). This was usually due to a delay in changing film, extra maneuvering the airplane, or any other event which delayed the “after” density sample for several minutes after the completion of the run. While normally the density associated with each speed sample was an average of the “before” and “after” density sets, in these cases only the “before” or “after” density set would be used (as directed by the observer).

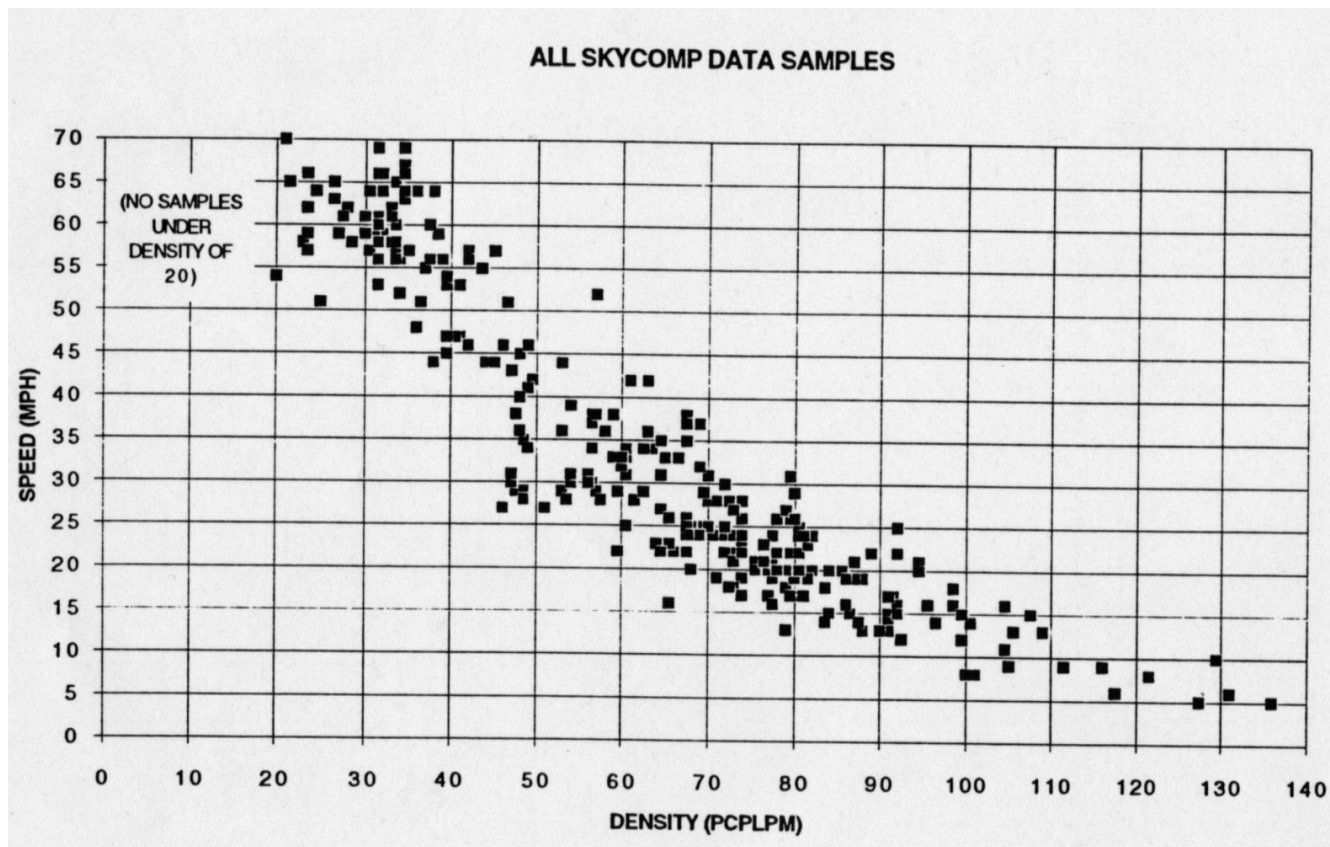
With regard to selection of target vehicles, the plan was to select cars that reflected the average speed of traffic, just as floating car drivers are instructed to approximate the speed of traffic flow. Fortunately, vehicles have little freedom to choose their speeds in the congested density ranges (above 40 pcplpm). So, for example, almost any vehicle in a congested traffic stream in the middle lane of three will give a suitable floating car measurement. Even tractor-trailers (unless heavily loaded and traveling uphill) moved at the same speed as passenger cars. Thus the criteria the observer used in selecting each target vehicle was 1) is it in the correct lane; and 2) does the vehicle stand out so that it is easy to keep track of?

Also, in the event that the highway had four travel lanes in one direction, alternating samples were taken from both middle lanes.

In the event that a driver switched lanes while being tracked, the observer noted the lane change and also noted which lane the car spent the majority of time in (this is the lane for which a density count would be made later). In several cases (infrequently), the observer abandoned tracking certain vehicles when: 1) the driver made multiple lane changes, trying to beat the average speed of traffic; 2) the driver switched lanes and changed speeds obviously and significantly; 3) the vehicle turned out to be a heavily loaded truck which delayed the traffic stream; or 4) the observer “lost” the vehicle being tracked. Also, for the samples made with traffic traveling at free-flow speeds, vehicles were abandoned which proved to be traveling significantly faster or slower than the average speed of traffic.

In the event that the target vehicle moved to the right lane in apparent preparation to exit, the observer often was able to switch tracking to another vehicle that had been just behind or ahead of the original vehicle in the same lane (and used the newly adopted vehicle to complete the sample). This was necessary because in some cases six or seven minutes had been invested in the tracking of a specific vehicle, and it was important to avoid wasting that time where possible.

It should also be pointed out that speeds were not tracked for very slow moving queues (densities over 120 / MWCOG samples only). Instead, density runs were made at 5 or 10 minute intervals, such that later on the ground the same vehicles could be found in succeeding sets of density photos; this allowed computation of speeds and associated densities.



DATA PROCESSING

After each flight, a topographic map was prepared for each zone which showed the starting and stopping points for each tracked car. Measurements were then made of the segment length (distance traveled). Then each tracked vehicle was entered into the computer database, including:

1. vehicle description
2. time-of-day
3. initial lane and subsequent lane changes
4. precise travel time (from stopwatch or time-lapse photographs)
5. density-photo preference, if any (default was to average the before- and after- density samples)
6. any special notes pertaining to that vehicle.

After the photos had been processed, each set of overlapping “density” photographs was taped together into a “mosaic” that showed each entire segment. Then vehicles in the required lane(s) were counted, listed by “car”, “truck”, “tractor-trailer” and “bus”. These totals were translated into passenger-car equivalents (PCE’s) using the following values:

| <u>Vehicle type:</u> | <u>PCE’s:</u> |
|----------------------|---------------|
| cars | 1 |
| trucks | 1.5 |
| tractor-trailers | 2.0 |
| buses | 1.5 |

(It should be noted that the distinction between “cars” and “trucks” could not be cleanly made, since there are many varieties of light and heavy pick-ups (both covered and uncovered). In general, a pick-up or van had to be at least twice the size of an average-sized car to be considered a “truck”.)

PCE’s were then divided by segment length to calculate densities. These density samples were then matched to corresponding speed samples; each speed/density data pair was then plotted on the chart.

CALIBRATION OF THE VAN AERDE MODEL

Van Aerde Model DRAFT -- 15 Feb 96

The main advantages to a single-regime model are that boundaries between regimes do not have to be defined; and curves from adjacent regimes do not have to be spliced at the boundaries. A single-regime model allows for a more subjective and repeatable calibration process. This will be especially true if more data from the high-speed end of the curve is ever incorporated into this process.

The disadvantages to this particular model are that it expresses this project's independent variable as a function of the dependent variable; and that it is a non-linear function. These disadvantages make performing the initial calibration more difficult. However, once SAS programs for the task are written, they can be used again usually with a minimum of effort.

The procedure for calibration was as follows: 1) The model's equation was coded into a spreadsheet so that the shape could be defined by recognizable parameters: two points that the curve passes through, the free-flow speed, and the speed at capacity. By overlaying this curve with the scatter plot of the observations, initial estimates of the parameters were made. 2) The initial parameter estimates, the equation, and the observations were used in a SAS PROC NLIN job to machine-calibrate the parameter estimates. 3) A second SAS program translated the calibrated equation into a look-up table that expresses speed as a function of density. 4) The results of the SAS work were imported into a spreadsheet for plotting and for calculation of prediction intervals.

Two outstanding technical issues related to this procedure are determination of the free-flow speed, and calculation of prediction intervals.

The free-flow speed for best fit can be determined by the PROC NLIN program, as are all other parameters. Due to the lack of data at the low-density region of the model, PROC NLIN returns a very high free-flow speed. Additional data from MD SHA was used to calculate a free-flow speed for general application on the Beltway. The calibration of the model presented here resulted from forcing the free-flow speed to match the SHA data analysis.

The prediction intervals shown in the current plot were calculated after the model was translated. This may have not been appropriate. PROC NLIN calculates prediction intervals directly as it calibrates the model. Those prediction intervals express density as a function of speed, however. Work is in progress to translate them, and to otherwise arrive at the most appropriate method of determining prediction intervals. Since a single-regime model is more suitable in a computerized process, and for lack of significant difference in performance, the Van Aerde model is preferred over earlier approaches examined by MWCOG staff and presented before subcommittees.

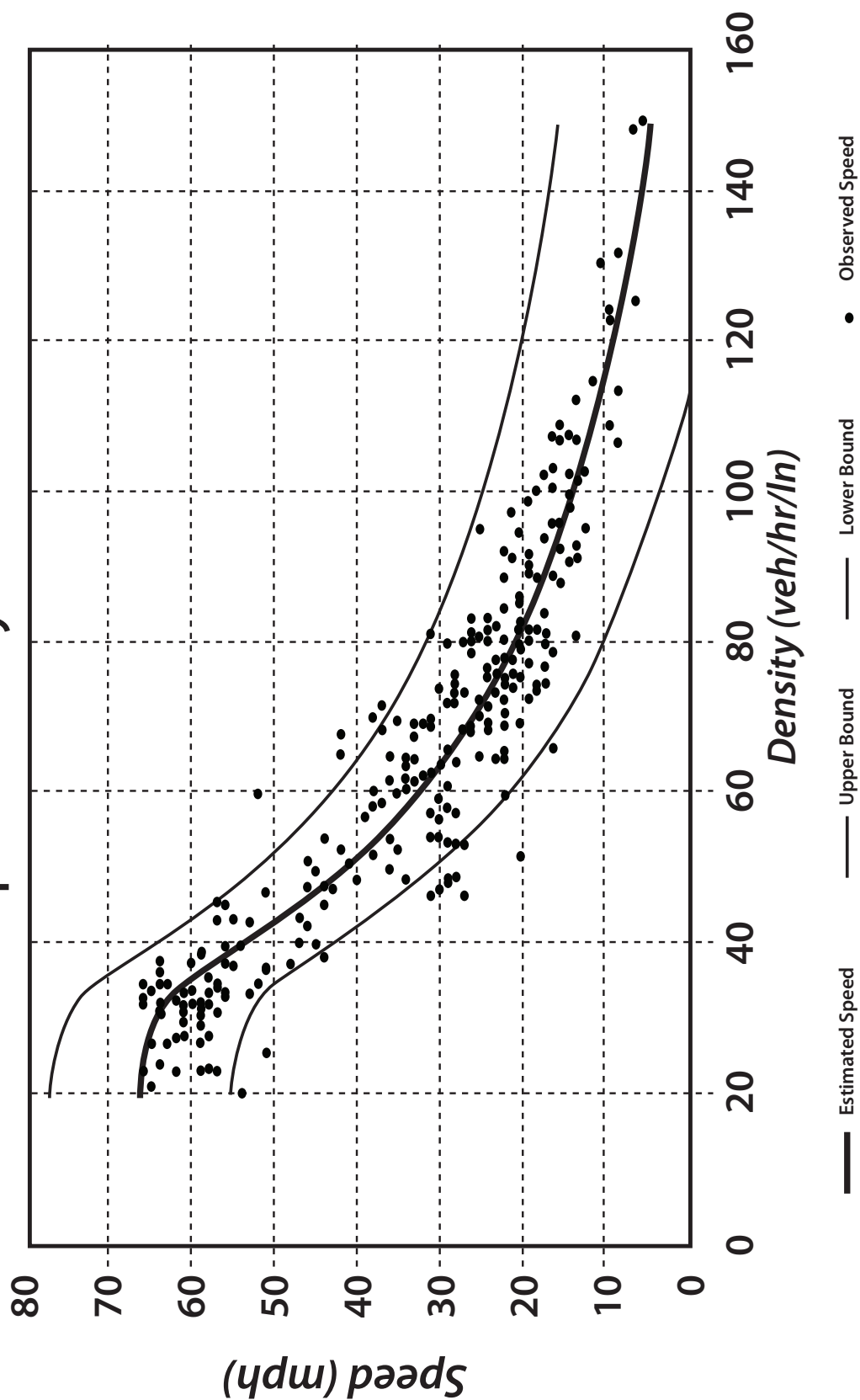
Speed-Density Calibration
Van Aerde Single Regime Model

free-flow spd = 67 mph / c1 = 0.00512 / c2 = 0.0114 / c3 = 0.000342

| | DENSITY (veh/ln/mi) | SPEED (mph) | VOLUME (veh/ln/hr) |
|-----------|------------------------|----------------|-----------------------|
| free-flow | 0 | 67.0 | 0 |
| | 20 | 66.4 | 1,328 |
| | 25 | 65.8 | 1,661 |
| | 30 | 64.6 | 1,946 |
| | 35 | 61.3 | 2,144 |
| capacity | 39 | 55.8 | 2,190 |
| | 40 | 54.7 | 2,189 |
| | 45 | 47.8 | 2,153 |
| | 50 | 41.9 | 2,094 |
| | 55 | 36.8 | 2,025 |
| | 60 | 32.6 | 1,954 |
| | 65 | 28.9 | 1,880 |
| | 70 | 25.8 | 1,806 |
| | 75 | 23.1 | 1,731 |

| | DENSITY (veh/ln/mi) | SPEED (mph) | VOLUME (veh/ln/hr) |
|--|------------------------|----------------|-----------------------|
| | 80 | 20.7 | 1655 |
| | 85 | 18.6 | 1580 |
| | 90 | 16.7 | 1503 |
| | 95 | 15.0 | 1425 |
| | 100 | 13.5 | 1350 |
| | 105 | 12.1 | 1271 |
| | 110 | 10.9 | 1197 |
| | 115 | 9.7 | 1117 |
| | 120 | 8.7 | 1043 |
| | 125 | 7.7 | 963 |
| | 130 | 6.8 | 885 |
| | 135 | 6.0 | 810 |
| | 140 | 5.2 | 729 |
| | 187 | 0 | 0 jam |

Van Aerde Single Regime Model Speed-Density Calibration



Van Aerde Single Regime Model

